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LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLIII. No. 3015.] LONDON, FEBRUARY 23, 1921. [73rd Year. Price 1s.

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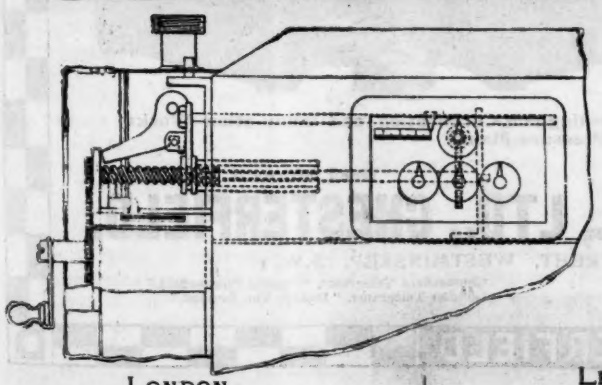

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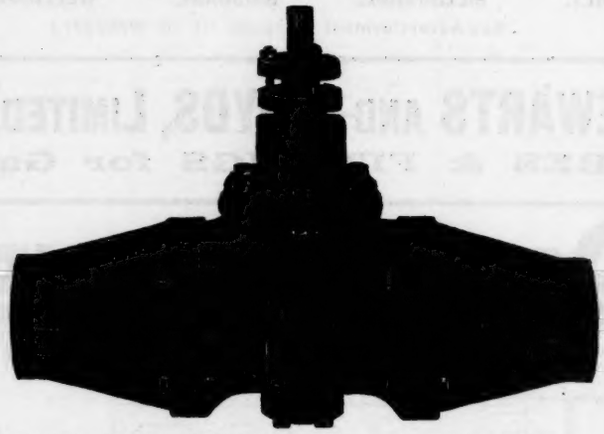

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EDITORIAL NOTES.

The Inerts Inquiry Opens.

THE inerts inquiry began last Wednesday; and the Committee—Mr. J. Hunter Gray, K.C., Mr. W. J. Atkinson Butterfield, and Dr. C. H. Lander—had before them representatives of the Sheffield Gas Consumers' Association, headed by Mr. D. Flather. The activity of this body in connection with gas supply has been great, because, as furnace users on a large scale, their interest is great. This must be admitted. It must also be conceded that, in this particular direction, they have large experience. But what they have not got, it is now abundantly clear from their own evidence before the Committee, and the replies they gave to the questions addressed to them, is any conclusive evidence that they are on the right track in respect of their supposed grievances and claims. It was a singularly incoherent case that they put forward, and one that in parts was extremely contradictory. In fact, they are wandering about in this matter in a state of nebulosity. They manifestly feel this themselves; otherwise they would not ask that the whole question should be subjected to scientific investigation. This very fact proclaims uncertainty, and insists that it would be very dangerous to make recommendations on such superficial and empirical evidence alone. The Association have worked hard at various times for a limit being put to both minimum calorific value and maximum proportion of inerts; and now it appears that they have asked for these limitations purely on hypothetical grounds. They have been stimulated to activity, it is plain, from two causes. The first is the inconstancy of the gas supply during and after the war, which was an ungovernable condition in most gas-supply districts, owing to coal quality and delivery being bad, labour deficient, and plant depreciating through pressure and forced undermaintenance; and the second is that the cost of gas for furnace work has gone up considerably, which, again, is a regrettable but unavoidable circumstance. They were satisfied before the war; and they have as yet had no experience of working under the heat-unit basis, and calorific power which will have to be fairly constant, and never below the declared, under the conditions laid down by the Gas Regulation Act. Everything is exceedingly inconclusive so far as the men from Sheffield were able to submit a case for inerts restriction. It would be absolutely unfair to apply restriction on such evidence—evidence mainly of experiences during war time; and we will give the representatives of the Association credit for agreeing with this, in view of their suggestion that a scientific investigation should be made, which, however, is not within the scope of the reference to the Committee. Probably before the inquiry ends, the Committee will have had the necessary scientific testimony before them.

The Committee have nothing to do with calorific value or with pressure. These are matters that have been settled by the Gas Regulation Act. As to inerts, the Association are relying on wartime figures. The prepared statement put before the Committee alleged that in three years the minimum quantity of inerts in Sheffield gas was 10·4 p.ct.; the maximum 51·8 p.ct.; and the average, 27·8 p.ct. In 1918, the average is represented as 29·7 p.ct. But one of the representatives—Mr. J. Imrie—put the proportions of the "inerts" in the gas thus: 10 p.ct. air, 13·3 p.ct. nitrogen, 3 p.ct. carbon dioxide. These figures total to 26·3 p.ct.; and 10 p.ct. of this is "air"—leaving a balance of 16·3 p.ct. The weakness of this was at once apparent; for all gas must contain an amount of inerts—that is unavoidable; and all gas must have air for the purpose of effecting complete combustion. If the gas contains within itself 10 p.ct. of air, then so much less air (with its 79 p.ct. nitrogen constituent) is required. And the representatives of the Association omitted to show the Committee that each volume of gas-air mixture as delivered at the point of combustion contains approximately the same amount of inerts whether the air is in the gas before delivery to the burner or added as air at the burner. The point was made much of that the inerts supplied with the gas have to be heated up; but this would apply equally whether they are supplied in the gas or in the air requisite for combustion. The fact of the matter is the Association have been jumping at conclusions. We can quite understand disuniformity of supply upsetting the working of furnaces during the war; but under the more uniform conditions that must develop within reasonable time under the Gas Regulation Act, things will undergo a considerable change.

Confusion and misunderstanding of the position in regard to inerts are demonstrated by other of the submissions put before the Committee. But before dealing with these, there are two points in the statements made against which there must be protest, though we appreciate that exaggeration will not have any effect with a Committee constituted as this one is. Mr. Imrie stated that, when Sir George Beilby issued his report upon gas standards, he had no idea in his mind that producer gas would be supplied by ordinary gas undertakings, because it was practically producer gas that was being sent through the mains to-day. That is untrue. We think, too, that Mr. Sarjant was under a total misapprehension when, in reply to a question by the Chairman as to what he considered should be the minimum of inerts a gas should contain, he said that he had spoken to an official of the South Metropolitan Gas Company that morning at Olympia, and had been told 1 p.ct. If this is true, then the South Metropolitan Company will certainly look after the better education of that official before allowing him to mislead members of the public again.

There was a good deal said by the Association representatives during the evidence as to producer gas, with its heavy percentage of inerts, as well as regarding the type of furnaces used. It amounts to this, that, according to the type of furnace (speaking generally, and having in mind certain high-temperature operations), it matters little as to what is the percentage of inerts; and the Committee must have come to the conclusion, before the end of the evidence was reached, that furnaces as much as inerts are to blame for dissimilar experiences. Dr. Hutton, another of the representatives, was quite prepared to admit that it would be possible to replace many of the existing furnaces by furnaces which would work with a gas of less than 500 B.Th.U., and a high percentage of inerts. "The modern "regenerative furnace would probably permit of even a "producer gas being used." Mr. Imrie told the Committee that the furnace on which he based his experience was not on the regenerative principle; if it was, he could use producer gas. Mr. Wells admitted that his own Company had regenerative furnaces which worked quite well on producer gas. So if the furnace is right, the percentage of inerts can be of the heavy order. Later on, Mr. Wells said that there is a case on record in which blue water gas, having a calorific value of 250 B.Th.U., was used for steel melting which did not give such satisfactory results as straight producer gas of 140 B.Th.U., owing to hydrogen being deleterious in increasing scaling. Upon this the comment came from Mr. Butterfield that, in this case, the gas with the higher inerts was better

because of the effect of the water gas on steel. Thus the representatives of the Association proved, amid their contradictions, that a gas containing a high percentage of inerts could be used efficiently for furnace work provided the furnace was a suitable one. Of course, required temperatures and nature of work vary; and there are conditions in which the manufacturers would not put down regenerative furnaces. Making all allowances, however, the case presented is full of inconsistencies.

The representatives of the Association, too, want heat units in the form of gas at as low a price as possible. The low price will not in these times be obtained by the imposition of unnecessary restrictions. But the furnace users do not desire to face the expense of modifying the furnaces should the lower priced heat units necessitate. As to which in the long run would pay them better, they have not the ghost of a notion—assuming that furnace changes or slight modifications are actually requisite. It is the ultimate economy to the entire community that matters; and nothing must be done to hinder progress. We are glad the Sheffield Gas Consumers' Association have had a hearing; but, frankly, What have the representatives proved?

Dissension in 1912 and Co-Operation in 1921 Between the Gas and Chemical Industries.

IN mundane affairs through storm good understandings, alliances, and lasting friendships are frequently formed. This thought comes to mind as the announcement is read regarding the appointment of the Dye Advisory Licensing Committee, and its constitution is noted. The gas industry and the chemical industry are interdependent. The one cannot do without the other; a large part of the prosperity of either depends upon that of the other. At one time the gas industry looked upon the chemical industry as a customer who beat it down to the lowest possible point in purchasing secondary products arising from the manufacture of gas; and the chemical industry took relatively little interest in the operations of gas undertakings, other than to treat them as sources of raw materials the acquisition of which it was its business to make on the terms that would yield to it the utmost profit. And many gas undertakings having then no other market for certain of their products were more or less helpless. But there have been signs, and more than signs, of late of the growth of a mutual interest and consideration—traceable to several causes, one of which is the active part that Dr. Carpenter has taken in the work of the Society of Chemical Industry, which resulted in the tenancy by him of the presidential chair, and brought before the chemical industry the work of gas undertakings in a manner not previously thought of. Other factors and undercurrents have also operated to the same satisfactory and beneficial end.

These reflections bring to mind the year 1912. In the session of Parliament of that year, the Alkali Manufacturers' Association lodged a petition to limit the purchase by an individual gas undertaking of bye-products of other gas undertakings, and so restrict the quantity of bye-products that any one gas undertaking could work up. We will not now reopen the history of this matter. It is all well known. We remember the strength with which the chemical industry urged the protection of chemical manufacturers against gas undertakings competing with them for the raw materials that they require, and which are fundamental to much of their own work. We remember, too, the strength of the resistance the gas industry naturally made to the attempt to close or limit one of the roads to its own development from its own products. Each industry was out to defend its own economic interests; and from that point of view (if from no other) the alkali manufacturers could plead justification for their attitude. The upshot was the model clause which defines an allowable purchasing power from other gas undertakings of an amount of any secondary product equal to one-third part of the purchasing undertaking's own production. This clause has been applied to several gas undertakings. But there was another result of this contest which is not so generally well known. To obviate future difficulties in working together, the large gas undertakings which practise on a big scale the working-up of the bye-products of gas manufacture, arranged that, by means of internal book-keeping, their bye-products departments should be wholly sequestrated from the business of manufacturing and distributing gas. We know, for example, that in the case of the South Metropolitan Gas Company considerable pains have been taken to operate the chemical bye-products section of the business (which is conducted in self-contained works) on strictly commercial lines; and the internal accountancy of the department is kept entirely distinct from all other departments of the Company. This policy in no small measure has contributed to bring about a better understanding between the alkali manufacturers and gas undertakings. And it may be stated without exaggeration that such gas undertakings are now accepted not only as important members of the chemical industry, but are welcomed as true chemical manufacturers, unfettered by any of the peculiar advantages that their statutory powers were once supposed to confer upon them. This is as things should be; and we hope to see a considerable development of this amity.

Perhaps, however, the strongest influence in promoting new understanding and appreciation of mutual interest was the services to the country of gas undertakings during the years of war. These services, we are confident, brought the alkali manufacturers to realize in a way that nothing else could have done the potentiality in the chemical industry of the producers of raw materials; and the success of the country to deal adequately with the problems of the manufacture of high explosives, may be attributed largely to the happy working conditions which existed between the alkali manufacturers and the gas-works of the kingdom.

Now we have the announcement as to the constitution of the Dyes Advisory Licensing Committee, appointed by the Board of Trade to operate the new Dye Stuffs (Import Regulation) Act of 1920. One of the members, it is seen, is Mr. E. V. Evans, F.I.C. The work of Mr. Evans for the gas industry is well known to "JOURNAL" readers. His latest contributions to its technical literature, it will be remembered, were made towards the end of last year at a meeting of the Southern District Association of Gas Engineers and Managers. Being the Chemical Products Manager of the South Metropolitan Gas Company, we see in this appointment to the Dye Advisory Licensing Committee, not only recognition of the position of the gas industry in relation to the chemical work of the country, but a tightening of the tie between the gas and the chemical industries. To give point to this—to emphasize the changed conditions of 1921 and 1912 in this respect—is the object of this article, and not to eulogize any particular official or the Company he serves. These are changes in relationship which it is our business to foster. They are good for both industries, because from a sound alliance and understanding between two industries that are fundamentally concerned in the prosperity of each other, there is increased strength for both.

Mr. Charles Hunt and the Sliding-Scale.

THE Chairman of the South Suburban Gas Company (Mr. Charles Hunt) is one of the staunch defenders of the sliding-scale. There are many such; but we detect in the industry the beginning of a veering round of opinion, after the experiences of the past few years, to a preference for a condition of things which would permanently give a sense of security to gas share and stock holders—such as the system adopted in the South Metropolitan Gas Company's Act of last year. We are not sure that Mr. Hunt himself, with all his gratitude to, and praise for, the sliding-scale (which we fully share so far as it applies to pre-war circumstances), would not prefer to see something of the same nature generally applied, though he does not give any overt expression to the feeling. He has no quarrel with the sliding-scale; if he has any quarrel at all, it is with the wholly unpleasant circumstances which made it during the war and since unworkable and ruinous to gas companies operating under it. This shows a defect in the sliding-scale—a defect which no one foresaw, and a defect which for six long wearisome years has piled loss upon loss, in dividends and market values, upon the providers of gas capital. If some statistician would devote himself to collecting the details of these losses, he would find the aggregate a stupendous one. It is the price paid for a defect. Then the most sensible course it seems to us is to positively ensure that in no circumstances shall the defect again operate; and in considering this aspect of the matter, due weight has to be given to the fact that pre-war conditions no longer exist, and new ones of a more sensitive and onerous character have taken their place.

However, Mr. Hunt is of opinion that the Gas Regulation

Act supplies the omission that the designers of the sliding-scale originally made through not anticipating a condition of things—then without precedent—such as we have been experiencing the last few years. It does this up to a point, and so gives better protection to share and stock holders, by providing that if at any time costs and charges have substantially altered, through circumstances beyond the control of the administration of any gas undertaking, application may be made to the Board of Trade to revise the standard price. And it may be taken that the Board would act justly. But the costs and charges will have altered before this can take place. Something will have to be in existence to warrant the change; and at what stage in dividend reduction would the Board consider that it was time for them to make a revision? Would it be when the dividend had shrunk to the standard amount? Or would it be after it had descended below the pre-war dividend payment? The South Suburban Company are fortunate in having a 5 p.ct. standard; but the matter has to be looked at generally, and so from the point of view of those companies with a 4 and 3½ p.ct. standard. The South Metropolitan Company under the sliding-scale had a 4 p.ct. standard dividend; under their new system of dealing with profits, they have a 5 p.ct. basic dividend on existing stock, and 6 p.ct. on new ordinary stock, and this basic dividend is a minimum whatever befalls. There is no certainty as to when revision will apply under the provisions of the Gas Regulation Act; but there is a feeling of security in having a respectable standard or basic dividend, which is also a minimum whatever happens—whether temporarily or permanently. This condition can be secured, by adopting the South Metropolitan plan, through a Special Order.

There is another point. "We have already seen," said Mr. Hunt, "that the companies are to be restored to their "pre-war position." This is what proprietors have been hoping for—that the restoration of "position" would include themselves. But it is perfectly clear that, although the Board may add what appears to them to be "reasonably "required in order to meet the increases (if any) due to cir-"cumstances beyond the control of, or which could not "reasonably have been avoided by, the undertaking, which "have occurred since the 30th of June, 1914, in the "costs and charges of, and incidental to, the production "and supply of gas by the undertakers," dividends are not going to be restored immediately to the pre-war figure. At the same time, dividend restoration is what has been anticipated. It is what is not happening to the full; and gas administrators do not see any chance of immediate realization, notwithstanding that there is to be added a figure that may reasonably be expected to meet the increased costs and charges that have arisen since 1914. At the price per therm that is to be the equivalent of the present charge for gas, the Gas Light and Coke Company only anticipate first payments to be at the rate of £4 13s. 4d. p.ct. per annum, and not at the pre-war rate, And Mr. Hunt does not see "an "immediate prospect of a return to 6 p.ct." for the South Suburban proprietors. We are not raising these points with the view of creating any discontent; but simply with the object of helping to avert disappointment on the part of the share and stock holders, and to advise present satisfaction with the improved payments when made, and the entertaining of hope for more congenial conditions which will enable complete restoration of pre-war payments.

Reverting to the operation of the sliding-scale and the South Metropolitan plan. Mr. Hunt alludes to the origination of the sliding-scale, and his remark is noticed that he rather thinks that at first the proposal was made that the slide should only operate one way. "Had this then been agreed to," he remarks, "the gas history of the last few years "might have been written differently." There seems to be regret underlying those words. Then why continue to perpetuate the slide both ways, when Parliament has now endorsed in the South Metropolitan Act the principle of a basic price and minimum dividend, with a defined share by consumers, proprietors, and workers in the profits made when the charge for gas is below the basic price? The existence of a minimum dividend will always be a protection in temporarily adverse conditions, and till, if new adverse conditions become established on a permanent basis, the opportunity for revision comes. The feeling of security given to investors by the minimum dividend and the slide one way as under the plan of the South Metropolitan Company is, and will be, an asset of no mean importance in the days of uncertainty and financial disturbance and stress.

Furnace Efficiency and Mixture Velocity with Lower Calorific Value Gas.

IT cannot be expected that the gas industry will gain all at once the therm production economies that the Gas Regulation Act will enable it eventually to make. These economies will be brought into account gradually, and not by any revolutionary process. We look upon the Act as a means to an end; and the end of ultimate economy in the provision of therms for sale at the lowest possible cost will only be realized progressively. As has before been pointed out in dealing with the contributions of the authors of the special series of articles which have been appearing in our pages since the beginning of the year, the progress in increasing per ton of coal used the number of B.Th.U. in the form of gas by making gas of lower thermal concentration per cubic foot, will have to be governed largely by the conditions at the consuming end. Adaptation there must precede any serious change from past conditions, or there will be trouble, and trouble will breed discontent which it will be difficult to banish. The point is made by Dr. C. M. Walter in the contribution this week, in which he applies the extensive experience he has had in Birmingham to the consideration of the relation to industrial heating of the powers conferred by the Gas Regulation Act. The freedom that is conferred by the Act upon gas undertakings to "declare" the calorific value of the gas they can most economically provide carries with it the responsibility of supplying the thermal units at such a concentration as will enable the consumer to use them in the most efficient manner in the apparatus as it exists, or with modification that can be at once reasonably effected. It may be that in an area of supply all the apparatus is of a character that quick adaptation can be made for a much lower calorific value per cubic foot. If so, then there can be progress at a good pace. But this would not apply to many districts, and caution is necessary. The warning that Dr. Walter gives in this connection is one that is well in the minds of most gas men; but there are enthusiasts abroad who would prefer the industry to take a long jump, and be negligent of consequences. That will not do.

While, however, efficient utilization at the consumers' end will or must largely govern production, economic growth at the producing end cannot be allowed to be stunted by accepting as unalterably stabilized the conditions of utilization. Critical conditions are to be found in the domestic gas-consuming region; but Birmingham war experience with lower calorific grade gas, as Dr. Walter shows, has disclosed difficulties in certain gas-furnaces which cannot pass unheeded, but which fortunately have a corrective where circumstances will allow it to be applied. The makers of gas-furnaces—in fact, of all gas-heated appliances—should make an immediate study of this matter of enabling their productions to be speedily modified so as to render them efficient for any reasonable thermal concentration per cubic foot of gas. Such appliances are bound to become more popular with buyers than any others. It is unquestionably to the interest of manufacturers to work simultaneously with the producing end so as to make the path smoother for the progress of work in cheapening the therm. The cheaper heat energy can be placed in the hands of users in all directions, the better for the gas industry and the makers of the apparatus for utilizing that energy.

Dr. Walter deals somewhat in detail with the effects of low calorific value gas with certain types of furnace. He classifies the apparatus into five groups; and in the first of them (the article must be referred to for the types), so long as the temperature head available for heat transfer is comparatively high, the calorific value of the gas employed does not materially affect the working efficiency, provided that modifications and adjustments are carried out to meet the new requirements brought about by the change in the form of the flame produced. This statement also applies generally to the next three groups, excluding high-pressure gas systems used in connection with the heating of combustion chambers where the primary aëration is effected at the expense of the kinetic energy in the gas itself. But in certain types of apparatus to which Dr. Walter refers in these groups, difficulties are found in maintaining the flame temperature on a reduction of calorific value, unless the mixture velocity is increased, which means that modifications in the design of the injectors or combustion chambers to enable, with lower calorific value gas, the B.Th.U. equivalent of the former supply to be utilized, will not result in main-

taining the original efficiencies unless the velocity of the mixture is increased. The difficulty of obtaining sufficient concentration of combustion, and therefore high flame temperature with the atmospheric form of burner with a lower grade gas, manifests itself to a much greater extent in the case of the apparatus in Group 5. Seeing that this group constitutes a large proportion of the gas-furnaces in manufacturing districts, the point that Dr. Walter makes as to mixture velocities is an important one; and this, we are afraid, few people interested in industrial heating have fully appreciated. It is a matter that, as soon as possible, the Gas Investigation Committee should inquire into and test, now that Dr. Walter has brought it so prominently to notice, because in industrial areas in which furnaces are used it is highly essential that efficiency of use shall be raised to, and be maintained at, the best possible maximum under working conditions. Fortunately there is a corrective. Mixture velocity can be raised to the necessary degree by increasing the pressure of gas at the injector, or of the air, by some pressure-raising device—provided that the B.Th.U. equivalent of the gas of lower calorific value is employed for the heating operation. The additional cost of doing this will be relatively small.

The article deals with several other points that will interest those responsible for furnace efficiency, having in view changes in heat-unit concentration; and the interest will be heightened when read in conjunction with the article which succeeds this one, dealing with carbon monoxide in relation to furnace work.

Carbon Monoxide and Industrial and Domestic Gas.

IN these days one cannot separate gas supplied for domestic purposes from that sold for industrial uses. The conditions of supply will not permit it; and therefore there must be great care that any regulations that are imposed in respect of domestic gas do not react detrimentally upon industrial operations. British industry to-day wants all the aid it can get; it has had more drawbacks (like the gas industry) than it can conveniently bear. Hence the present trade retrogression. Hence, too, it must not be dismissed from consideration in any matter that directly or indirectly affects it. In view of the impossibility of separating at the present time the industrial gas service from the domestic gas service—and it will never be possible in some areas—the terms of reference to the Board of Trade Committee on the Limitation of Carbon Monoxide are wrong. They have to consider whether it is necessary or desirable to prescribe any limitation of the proportion of carbon monoxide which may be supplied in gas for "domestic" purposes; but nothing is said as to industrial uses. Yet the gas made, distributed, and sold for domestic purposes is the same gas that is made, distributed, and sold for industrial heating. The one producing and distributing plant deals with the gas that is utilized for industry and for household needs. As, however, the Committee have to consider the question of the "desirability" of limitation, they cannot exclude the effect that any limitation of carbon monoxide in gas used for domestic purposes would have on industrial operations in which the same gas is employed. Carbon monoxide is a very valuable constituent in all high-temperature operations—whether industrial or domestic. The point was made before the Committee in the evidence of Mr. T. F. E. Rhead, the Chief Chemist of the Birmingham Corporation Gas Department. He stated that a carbon monoxide flame radiated 2·4 times as much heat as hydrogen, which renders it helpful in metallurgical operations. It is also less likely than methane or hydrogen to give rise to explosive mixture, because it requires a minimum of 12·3 parts of carbon monoxide mixed with air to give an inflammable mixture, while methane requires only 5·3 parts, and hydrogen 4·1 parts. It has a high flame temperature, which is, as we have said, a useful property in high-temperature operations. Any interference with the efficiency of gas supply or progress in gas supply for industrial operations will be economically disadvantageous to the domestic gas consumer.

Some time ago, the relative values or efficiencies of carbon monoxide and hydrogen in metallurgical work were the subject of controversy and investigation; but latterly the question has been lying more or less dormant. It was raised again recently by Prof. R. V. Wheeler, of the Sheffield University, at a meeting of the Sheffield Association of Metallurgists and Metallurgical Chemists. Which is the preferable constituent of gas for furnace fuel—carbon monoxide or hydrogen? And Prof. Wheeler left his hearers in no doubt as to the definiteness of his reply. Unquestionably the best method of obtaining knowledge of the behaviour of a gas during combustion is from an investigation of the speed propagation of flame in its mixtures of air during what is termed the "uniform movement" of air with the flame. Curves were shown by Prof. Wheeler demonstrating the speed of flame in mixtures of hydrogen and air, carbon monoxide and air, and mixed inflammable gases. The conclusion to be drawn from the curves is that with a gas rich in hydrogen, a short flame must be expected in the furnace; while with a gas rich in carbon monoxide a long flame will be given. Then, while the calorific values of the two gases are approximately the same, the radiating efficiency or power of the flame is greater in the case of carbon monoxide than hydrogen. It is readily seen that in furnace work there is considerable importance in the amount of energy radiated from the gases under combustion, seeing that the heating of the material in the furnace is largely performed by radiant energy; there is very little heating done by actual contact with the material. What Mr. Rhead stated in his evidence as to the difference between the radiant energy of carbon monoxide and hydrogen is confirmed by Prof. Wheeler, in giving the approximately like figure of 2¼ times as much radiant energy for the carbon monoxide as for the hydrogen. So here again carbon monoxide scores over hydrogen as a furnace fuel. Another characteristic of the two gases that Prof. Wheeler examined was as to their power of combining with oxygen in contact with a heated surface. Hydrogen is peculiar in the rapidity with which it combines with oxygen in contact with a heated surface; while a high carbon monoxide gas would not have a detrimental effect on the brickwork, even though the flame might burn on it—in fact, it would have no more effect than ordinary wear or tear. On all counts, therefore—the length of flame, the amount of radiant energy from the flame, and the effect on the brickwork and the material under treatment—it is clear that carbon monoxide is the more efficient furnace fuel. Steel melters would consider they were being robbed of something if compelled to use a gas rich in hydrogen instead of one rich in carbon monoxide.

Therefore, though the reference to the Carbon Monoxide Committee specifically mentions "domestic" gas, practical conditions affecting the supply of industrial gas and the efficiency of its use cannot be denied consideration when determining as to the desirability of any carbon monoxide limitation.

Migration from the Professional Ranks.

It is very noticeable that from the ranks of gas engineering men are somewhat frequently stepping into commercial activities associated with the gas supply industy. Of course, the prospect of obtaining larger reward (though perhaps not ill-paid for the work they have been formerly engaged upon) is the inducement for the change. But looking at the matter broadly, the drawing of professional gas engineers into the technical and trading work of firms is an advantage to the gas-supply industry. It is a good thing to strengthen the bonds between the one side of the industry and the other. It is a good thing for constructional and trading firms to have at hand the advice and assistance of men who have held responsible office in, and had actual experience of, gas manufacture, distribution, and utilization. Never was a time more favourable for this leavening and amalgamation of experiences. We look for good results issuing from it.

Local Authorities and Salaries.

There is an aspect of the salaries question which may be mentioned here. We notice that there are some technical appointments still being offered at extraordinarily low salaries—salaries that do not amount in these days to more than a foreman stoker would get. It is also seen that some local authority departments advertise for engineers and managers at low basic rates of pay, and mention on top the uncertain war bonus that is paid—the two items added together making about a respectable salary for the appointment. It is time that there was a permanent fusion between the two items, and the consolidated item be the starting-point for payment. There is pressing need for some local authorities to revise drastically their notions as to what constitutes fair remuneration for a man who holds such a position as gas engineer and manager, which position requires such

diverse technical and commercial qualifications, is one of great responsibility, and necessitates the closest application—never more so than now, and the future will be very exacting in its claims.

A Hint for Co-Partnership Companies.

In his address to the proprietors of the South Suburban Gas Company, the Chairman (Mr. Charles Hunt) stated that, in their application to the Board of Trade for a standard price per therm, a sum equivalent to 7½ p.ct.—the rate of the pre-war bonus—upon the present wages and salaries has been included for co-partnership.

American Coal for London Gas-Works.

Certain morning papers gave their readers last Thursday morning rather a cock-and-bull story about America being able to supply London with coal at a lower price than Durham Northumberland, or South Wales. It was based upon a report that the Gas Light and Coke Company had purchased a cargo of American coal, the all-in cost of which (though the coal had travelled over 3000 miles from the pithead) was lower than that of British coal transported at the most only a few hundred miles. "This is a surprising event," wrote one newspaper man. "Not only have the Americans broken the price of British coal on the Continent, but they have come to our very doors, and can sell here at a profit to themselves." Probably, if the morning papers had looked into the matter closely, they would have found that not only the Gas Light and Coke Company, but another gas company had bought some of this coal—not under any contract, but simply because it was on offer by merchants. A little further inquiry would also have disclosed the fact that this is some of the coal rejected by the Continent, owing to the glut of fuel there at the present time. Instead of losing more money in French ports waiting for someone to buy, and because the owners of the vessel wanted it home again, a medium size cargo of the American coal was offered at a tempting price to the Gas Light Company; and they purchased. That is the whole of the story of American coal for London.

The Drop in Coke and Coal Exports.

The Board of Trade returns for January show how seriously the bottom has been knocked out of the export fuel market. The quantity of coal exported was only 1,700,106 tons, compared with 3,358,572 tons in January last year, and 6,070,318 tons in January, 1913. The value of the quantity shipped last month was £5,555,708, as compared with £11,542,137 in January last year. The gas coke exported during the month amounted to only 31,619 tons, against 80,353 tons in January, 1920; and the value was £135,504, which averages £4 5s. 8d. per ton. This is a difference from the £10 to £12 which marked the peaks of revenue per ton for the gas coke that was exported at certain periods last year; and some of the coke at the figures obtained last month was no doubt shipped not because there was any particularly ardent wish to have it, but because contracts had been made for it before the great "landslide" in prices.

Gloom over the Coal Industry.

The coal industry is in a state of severe depression. More collieries have closed down, and others are on short time. Only a brief time ago the miners throughout the country struck work. They did not then think that so quickly the policy of their Federation would have contributed to throwing a large number from their ranks into unemployment again. The Federation have got the wind-up properly over the present position; and they have good cause. They are trying to put all the blame on to the Government; but the country knows they are themselves not so blameless as they would now like to be thought. Mr. Vernon Hartshorn, M.P., in the House on Wednesday, stated that the position promises to be much worse than it is at present. The unemployment and short-time conditions are reflected in the further fall in the output of coal. For the week ending Feb. 5, the production was only 4,418,200 tons—something different from the figures we were recording in December, when one week's output reached 5,307,000 tons. Another unpleasant thing is that Mr. Hartshorn, in the speech already referred to, indicated that there was not likely to be a wage agreement ready when the coal-strike agreement terminated at the end of March. Negotiations have been running since the strike in order to fix up a wage agreement; and the best proposal with which the workers are faced, he said, was one that would involve a reduction of 100 millions in wages, and an increase in the profits of the owners by from 27 to 80 millions. He intimated that there was no hope of settlement on any such lines. But are his figures correct, or subject to qualification in respect of slump and prosperous times? Anyway, the Mining Association say that Mr. Hartshorn's figures are devoid of foundation.

Coal Owners and No Increase in Price.

Good news comes from Derby. A meeting of coal owners, representing all fields, has been held there; and consideration was given to the question of the cost of coal. No definite decision was arrived at. But a majority of the owners expressed the opinion that the cost to consumers was already too high, and that a further increase would impose a ruinous additional tax on the trade of the country. It was also pointed out that an increased price would not remove the admitted evils of the high cost of production of coal. There is wisdom in the view.

Gas Charges and Electric Lamp Prices.

The electricity people are making the most of two incidents. One is the (it is hoped) temporary tenpenny increase in the charge for gas by the Gas Light and Coke Company, and the other is the reduction in the price of electric lamps. A paragraph in the "Bexhill Chronicle" (which has no doubt appeared partly or wholly in other provincial papers) is headed "Cheaper Electricity;" and in the main it refers to a reduction in the price of electric lamps, and not of electricity! The first lines contain more falsehood, in stating that the "recent bombshell from several of the gas companies operating in the London district is fast creating havoc among the unfortunate householders." The "several" is an enlargement from one! Then there is the statement that the prices of electric lamps—not of electricity—have been reduced; and it is thought there is but little doubt that the householder will "switch-on" to electricity without further delay. That is not very likely. Electric lamp reductions do not affect the costs of wiring, nor the present-day expense of electricity. When electricity has to fall back on misrepresentation in the attempt to attract new consumers, its case is bad indeed.

Amiable Intentions.

In the debate, in the House last Monday, on the Irish policy of the Government, Sir Hamar Greenwood read an extract from a captured memorandum issued from the headquarters of the Irish Republican Army, dealing with "operations" in this country. One paragraph reads: "For instance, if one train were wrecked it would have the effect of causing considerable alarm to the travelling public, and extra expense to the railway companies will be caused by patrolling the line or employing pilot engines. Also, if gas-works were to be blown-up, no doubt lives would be lost; but the effect of throwing a town into darkness would encourage organized and unorganized crowds referred to." The "crowds referred to" allude to this sentence in a previous paragraph: "Operations also should be directed in such channels as would encourage direct action by such bodies as Communists and the unemployed acting also with the mob in the direction of looting." To be forewarned is to be forearmed.

"Practical Engineer" Pocket-Book.—There is a great deal of useful information to be found in the "Practical Engineer" Mechanical Pocket-Book for 1921, which is issued by the Technical Publishing Company, Ltd., of No. 1, Gough Square, Fleet Street, E.C., at the price of 2s. 6d. net, post free 3s. It is the thirty-third edition—which fact is of itself sufficient to show that the pocket-book has proved of value. There are a number of sections relating to gas; and, indeed, any mechanical engineer who turned over the pages of the book would be likely to find some information of use to him.

Manchester District Institution of Gas Engineers.—As already intimated, the Institution have arranged to hold their annual meeting next Friday, at 2 p.m., in the Council Chamber of the Town Hall, Leeds, so that the members will be afforded an opportunity of inspecting the gas exhibition now being held there—a full account of which appeared on pp. 400-402 of last week's "JOURNAL." In the report which will be submitted at the meeting the Committee state that the membership is still well maintained, the number standing at 210, which is an increase of seven over the previous year. The election of new members, reports of the Commercial Sections, and some formal business, will be followed by the address of the new President, Mr. Samuel Tagg.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

IN THE YEAR 1920.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

——	Gas Light and Coke.	South Metropolitan.	Commercial.	Wandsworth.	South Suburban.	Tottenham.	Brentford.
Gas sold . . . . . thousands	31,963,543	14,205,038	3,919,402	3,025,064	2,942,003	2,622,480	4,501,303
Increase . . . . . per cent.	4·77	5·89*a*	3·36	6·95	8·26	7·03	5·22
Gas made per ton of coal carbonized. cubic feet	12,196	12,507	13,155	12,387	11,564	12,237	11,159
Gas unaccounted for . . . . . per cent.	7·48	5·02	8·18	8·55	8·18	7·43	6·93
Coke made for sale per ton of coal . cwt.	10·82	10·28	11·98	10·98	9·20	8·54	10·05
Tar made per ton of coal. . . . . galls.	8·96	9·28	9·39	9·39	9·23	8·21	10·80
Liquor made per ton of coal . . . galls, 8 oz.	33·90	39·17	34·73	36·01	35·70	33·92	33·76
Percentage of coke used as fuel	16·04	16·30	11·25	12·19	28·31	31·20	19·51
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year	9 0·08	8 2·29	7 7·79	7 8·93	8 7·08	8 8·79	6 8·35
Price charged per 1000 cubic feet	4 8	4/8 and 4/9¾	4/2 and 4/8	4/2 to 5/2	5/2 to 6/4 5/5 to 6/7	4/8 to 5/1 4/10 to 5/3	4/10 and 5/4
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	44·07	43·78	38·45	44·03	44·99	42·82	41·34
Less residuals—Coke and breeze.	28·69	24·31	18·34	19·38	15·53	14·20	11·15
Tar	5·18	8·53	5·84	6·75	4·86	5·35	4·92
Amm. liq. and sulph. amm.	2·46	3·37	2·61	2·57	2·54	1·85	1·80
Total residuals . . .	36·33	36·21	26·79	28·70	22·93	21·40	17·87
Net for coals, oil, &c. .	7·74	7·57	11·66	15·33	22·06	21·42	23·47
MANUFACTURE—							
Salaries	·49	1·69	·88	·67	1·12	·50	·84
Wages—carbonizing	4·97	4·39	3·82	5·11	5·36	5·38	4·64
Purification	·56	1·34	·52	1·01	·87	·81	·75
Repairs—plant	16·88	15·07	15·74	14·71	9·43	14·12	14·70
Net manufacture . .	30·64	30·06	32·62	36·83	38·84	42·23	44·40
DISTRIBUTION—							
Wages and salaries	2·37	2·09	2·01	2·18	2·54	1·67	2·42
Repairs—Mains and services, &c.	4·48	3·20	2·75	3·58	4·34	6·41	2·54
„ Meters and prep. meters and fittings.	3·14	5·08	4·20	3·56	4·73	3·49	2·19
„ Stoves—ordinary and prepayment .	2·90	3·34	2·74	4·54	3·02	1·29	2·08
Total net manufacture and distribution .	43·53	43·77	44·32	50·69	53·47	55·09	53·63
Public lamps—lighting and repairing	1·30	1·54	·90	1·05	1·66	·90	·99
Rents, rates, and taxes	4·43	2·90	3·04	2·04	2·07	1·97	3·42
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	·39	·40	·63	·61	·85	·56	·57
Collectors	1·15	1·71	1·74	1·19	1·22	1·02	1·02
Stationery and general charges.	·63	1·30	·81	·76	·77	·63	·58
Profit-sharing	·32	..	·30	..	·24	·16	..
Bad debts.	·04	·03	·01	·04	·02	·01	·03
Law and parliamentary charges	·01	·20	·02	·29	·19	·01	·03
Superannuations, Pension Funds, &c.	·88	1·09	1·08	·29	1·30	·40	·57
National Insurance	·12	·24	·10	·13	·11	·11	·11
Active service allowances	·00	·01	·01	..	..	·00	..
Sundries	·04	·04	·01	·02	..	..	·00
Total expenditure (*less* residuals) . . .	52·84	53·23	52·97	57·11*d*	61·90	60·86	60·95
GAS.	54·56	55·85	51·22	54·63	63·43	57·43	59·18
Rentals—Meters and prep. meters and fittings.	3·57	4·08	3·68	3·89	2·75	1·84	4·40
Stove	1·43	1·48	2·07	3·66	2·15	6·11	1·26
Incand. mantle maintenance . . .	..	..	·15	·34	..	·01	..
Miscellaneous	·14	·06	·00	·01	·06	·11	·01
Total—Gas, rentals, &c.	59·70	61·47	57·12	62·53	68·39	65·50	64·85
Balance, being profit	6·86	8·24	4·15	5·42	6·49	4·64	3·90
Dividend and interest	6·84	7·99	5·35	4·93	5·71	4·22	4·65
Surplus or deficit	·02	·25	Def. 1·20	·49	·78	·42	Def. ·75
Contributions to funds and sundry payments . .	..	·19*b*	..	·22*e*	·78*f*	..	·00*c*
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	46 8·06	42 9·18	43 2·79	47 1·03	..	46 0·05	..
Coke realized per ton of coal	32 1·66	23 3·26	24 11·09	20 0·49	17 10·65	16 11·45	15 7·67
Coke „ „ of coke	59 4·63	45 3·46	41 7·26	36 6·21	38 10·79	39 8·23	31 1·33
Breeze „ per ton	15 1·20	11 4·40	7 0·94	9 7·07	5 6·24	7 1·35	11 6·89
Tar realized per gallon	0 8·11	0 10·77	0 9·99	0 9·80	0 7·40	0 9·73	0 7·32
Amm. liquor, &c., realized per butt (8 oz.) . .	9 2·02	9 1·03	11 2·84	8 10·06	9 0·14	7 4·00	8 5·14
Percentage of stoves at rental to consumers . .	73	108	79	103	112	70	·96
Bad debts per cent. on total receipts	·04	·03	·01	·04	·02	·01	·04
Net profit per cent. on ordinary capital	3·01	5·22	1·95	3·74	4·63	3·50	2·02
One penny variation equals.	£133,181	£59,187	£16,331	£12,604	£12,258	£10,927	£18,755
Water gas, per cent. on total make	20·91	..	28·64	19·82	25·34	25·30	42·08

a Increase based on therms supplied = 5·43 p.ct.
b Cost of Writing-down Investments.
c Stamp Duty.
d Capital Duty Eliminated.
e Capital Duty.
f Capital Duty and Loss on Investments.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING YEAR, 1919.

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

——	Gas Light and Coke.	South Metropolitan.	Commercial.	Wandsworth.	South Suburban.	Tottenham.	Brentford.
Gas sold . . . . . thousands	1,454,654	790,437	127,374	196,594	224,469	172,321	223,296
Increase (variation equal to) . . . per cent.	**10·71**	1·01	**3·55**	**2·98**	9·56	1·00	·94
Gas made per ton of coal carbonized. cubic feet	**5**	232	**287**	**310**	123	652	**285**
Gas unaccounted for . . . . . per cent.	·68	**·46**	·88	**·16**	**1·75**	**·44**	**2·09**
Coke made for sale per ton of coal . cwt.	·56	·29	·39	**·05**	·26	**·03**	**·27**
Tar made per ton of coal . . . . galls.	**·19**	·11	·11	**·06**	..	**·61**	**·15**
Liquor made per ton of coal . . . galls, 8 oz.	**1·36**	·72	**3·45**	·06	**·56**	4·01	**1·67**
Percentage of coke used as fuel	**1·19**	**2·29**	**2·94**	**·60**	**2·35**	·04	2·06
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year	**0 4·79**	**0 4·87**	**0 0·30**	**0 1·05**	**0 4·61**	**0 5·79**	0 0·54
Price charged per 1000 cubic feet‡	0 3·50	0 3·44	0 9·00	0 6·00	0 9·75	0 8·50	0 9·00
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	6·69	3·21	6·49	6·84	7·87	9·58	3·84
Less residuals—Coke and breeze	12·01	4·47	4·52	5·46	3·49	3·52	2·29
Tar	2·74	5·54	3·10	3·57	2·43	2·99	1·97
Amm. liq. and sulph. amm.	·17	·51	·18	·80	·65	·53	·52
Total residuals . .	14·92	10·52	7·80	9·83	6·57	7·04	4·78
Net for coals, oil, &c	**8·23**	**7·31**	**1·31**	**2·99**	1·30	2·54	**·94**
MANUFACTURE—							
Salaries	·09	·41	·23	·06	·05	·17	·15
Wages—carbonizing	·73	·53	·53	·42	·94	2·76	·66
Purification	·09	·19	·15	·30	·33	·20	·02
Repairs—plant	5·80	2·90	6·92	4·34	1·80	3·87	6·02
Net manufacture . .	**1·52**	**3·28**	6·52	2·13	4·42	9·54	5·91
DISTRIBUTION—							
Wages and salaries	·40	·50	·45	·03	·22	·76	·39
Repairs—Mains and services, &c. . . .	1·51	·37	·40	1·35	·92	3·56	·82
" Meters and prep. meters and fittings	·70	·76	1·26	1·69	1·30	·80	·57
" Stoves—ordinary and prepayment .	·54	1·03	·40	2·18	·30	·38	·30
Total net manufacture and distribution	1·63	**·62**	9·03	7·38	7·16	15·04	7·99
Public lamps—lighting and repairing	·36	·57	·15	·04	·43	·63	·38
Rents, rates, and taxes	·80	·84	·96	·13	·20	·91	·50
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.).	·07	·03	·21	·04	·00	·09	·04
Collectors	·14	·26	·36	·15	·17	·47	·14
Stationery and general charges	·20	·35	·12	·03	·00	·08	·07
Profit-sharing	·03	..	**·08**	..	·08	·01	..
Bad debts	**·01**	·00	·00	**·01**	·00	·01	·01
Law and parliamentary charges	·00	·17	**·01**	·26	·06	**·01**	**·05**
Superannuations, Pension Funds, &c. . . .	·19	·38	·34	·01	·87	**·02**	·08
National Insurance	·04	·04	·03	·04	·03	·04	·04
Active Service allowances	**·04**	**·12**	**·14**	**·10**	**·16**	**7·46***	**·08**
Sundries	·01	**·00**	**·01**	·00	..	..	·00
Total expenditure (*less* residuals) . .	3·42	1·90	10·96	7·97	8·84	9·79	9·12
GAS	3·21	3·57	8·73	6·26	10 24	7·71	8·92
Rentals—Meters and prep. meters and fittings	·45	·15	·20	·69	·01	**·11**	·00
Stove	**·08**	·01	·18	·44	·12	2·09	**·12**
Incand. mantle maintenance . . .	..	..	·04	·16	..	**·01**	..
Miscellaneous	·01	**·01**	**·01**	**·04**	**·01**	**·02**	·00
Total—Gas, rentals, &c.	3·59	3·74	9·14	7·51	10·36	9·66	8·80
Balance, being profit	·17	1·84	**1·82**	**·46**	1·52	**·13**	**·32**
Dividend and interest	**·29**	2·22	**·38**	**·32**	**·02**	**·37**	**·13**
Surplus or Deficit.	**·46**	**·38**	**1·44**	**·14**	1·54	**·24**	**·19**
Contributions to funds and sundry payments .	..	**·07**	**·04**	**·10**	**·35**	..	**·07**
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	7 11·09	4 1·38	6 3·88	5 9·35	..	9 6·68	..
Coke realized per ton of coal	12 8·39	4 6·75	5 10·35	4 4·92	4 6·37	2 11·66	2 3·98
Coke " " of coke	21 5·95	7 9·91	8 8·33	8 2·10	9 0·26	7 0·81	5 3·78
Breeze " per ton	4 2·14	5 11·46	5 11·89	3 10·28	0 3·54	5 2·23	8 7·16
Tar realized per gallon	0 4·20	0 7·05	0 5·27	0 5·08	0 3·96	0 5·47	0 2·79
Amm. liquor, &c., realized per butt, 8 oz. . .	0 7·49	1 5·07	1 8·55	2 5·54	2 8·07	1 0·13	2 6·02
Percentage of stoves at rental to consumers . .	**6**	2	2	3	2	2	**1**
Bad debts per cent. on total receipts	**·03**	·01	·00	**·02**	·00	·01	·01
Net profit per cent. on ordinary capital . . .	·36	1·69	**1·39**	**·82**	1·67	·18	**·55**
One penny variation equals	£6061	£3293	£531	£819	£935	£718	£930
Water gas per cent. on total make	**2·70**	..	2·38	**1·82**	·45	**8·91**	**1·57**

* War wages included under this item in 1919. ‡ These figures show the average variation on the year in the Companies' principal areas.

THE GAS INDUSTRY ON THE HEAT-UNIT BASIS.

Special Articles.—VIII.

THE contribution this week is by Dr. C. M. Walter, of Birmingham. It is a little out of place in the series; but this was unavoidable. It should have come in proximity to that of Sir Dugald Clerk and the one by Mr. Ralph Halkett. But readers will agree that better to have it out of place than not to have had it at all. Within the article is compressed some highly valuable technical experience gathered in a city and its environs in which gas-furnaces are largely employed, and in which the necessity of supplying a lower calorific value gas during war time has produced experiences the lessons of which will be valuable in maintaining furnace efficiency, in connection with the trend to lower calorific values per cubic foot, as the possibilities develop which the Gas Regulation Act has brought into view.

THE GAS REGULATION ACT FROM AN INDUSTRIAL HEATING POINT OF VIEW.

By Dr. C. M. WALTER, Engineer-in-Charge of the Industrial Research Laboratory of the Birmingham Corporation Gas Department.

THE passing of the Gas Regulation Act (1920), carrying with it a heat-unit basis of charging, when looked at from an industrial heating point of view, rightly leaves each gas undertaking to decide for itself what calorific value gas it shall supply to its consumers, and further leaves open the door to modifying its declared value from time to time, as circumstances may demand. As the aim of every undertaking must obviously be to supply B.Th.U. to its consumers at the lowest possible cost per therm, it follows that while much has yet to be done in regard to the development of industrial heating appliances, the calorific value of the gas supplied must be capable of modification from time to time if the most economical results are to be obtained.

THE DECLARED VALUE.

If it could be stated that "one therm was as good as another" irrespective of the heating operation with which it was associated, the determining of the declared value for a particular undertaking would be reduced to a proposition to be considered from a manufacturing and distribution point of view. But as is known, the proposition is far more complex, and one which demands the most careful consideration from the consumers' end. Further, from what follows, it would appear that the fixing of this declared value will to a great extent depend on the requirements of the various types of apparatus in the manufacturing district concerned, and the possibility or otherwise of modifying any particular type or types of existing apparatus to render them suitable for use with gas of lower or higher thermal concentration, so as to meet as far as possible the requirements for the production and distribution of B.Th.U's. at the lowest possible cost per therm.

From a theoretical aspect, it is well known that some of the lower calorific value gases are capable of giving relatively high flame temperatures by reason of their comparatively high calorific intensity—always provided that the primary aëration is such that the combustion is complete, and sufficiently rapid to allow of this advantage being obtained. It is further found that provided the total amount of inerts is kept within reasonable limits, the thermal concentration of the combustible mixture does not vary to any great extent. From another point of view, the aëration of a low calorific value gas is generally considered easier to accomplish in practice than in the case of a higher calorific value gas, owing to the relatively smaller quantity of air required.

CLASSIFICATION OF INDUSTRIAL APPARATUS.

The extent to which the above is possible of realization in practice will now be considered according as the combustion of the gas takes place in the various forms of apparatus given in the following classification:

(1) Heating appliances employing atmospheric burners of the ring and bar type and other forms of open-flame type burners in which the transfer of heat is effected by flame contact with a metallic or heat-conducting vessel without the employment of a firebrick combustion chamber, including such apparatus as vats, boilers, white metal melting-pots, and some forms of soldering iron stoves—all of which require both primary and secondary air for the combustion of the gas.

(2) Furnaces employing open-flame type burners in which the heating is effected in a similar manner as in (1), but in which the degree of primary aëration is increased (and the flame temperature thus raised) by increasing the velocity of mixture prior to combustion by the employment of (*a*) gas under pressure, (*b*) low-pressure gas with air under pressure, (*c*) both gas and air under pressure, or (*d*) air-gas mixtures under pressure—which burners require both primary and secondary air for the combustion of the gas, but a greater proportion of primary air than in the case of (1). In the above types of apparatus, the heating efficiency is largely dependent on the temperature of the flame produced.

(3) Heating apparatus employing burners of the open-flame type used for such work as japanning stoves, core-drying ovens, drying stoves, and hot-air chambers, in the case of which the heating effect is dependent on the total B.Th.U's. supplied, and in which the heating efficiency is not necessarily dependent on flame temperature.

(4) Furnaces employing burners used in connection with high-temperature furnaces, in which the combustion takes place in combustion chambers composed of refractory materials—*e.g.*, metal-melting, forging, hardening, and annealing furnaces, and welding and re-heating apparatus employing burners using gas under pressure, gas with air under pressure, gas and air both under pressure, or air-gas mixtures under pressure.

(5) Furnaces employing simple forms of atmospheric burners producing large well-aërated flames as are required for annealing, re-heating, and any such work requiring moderately high temperatures and a non-oxydizing atmosphere in the furnace, and also certain types of low-temperature metal-melting furnaces.

It will be generally found that all forms of heating apparatus ordinarily used will fall under one of the above classifications, or a combination of one or more. The calorific value of the gas most suited for a particular operation will to a considerable extent depend on whether the gas-consuming appliances are dependent on the use of burners of the atmospheric type or on other forms of burners where either the gas or the air, or both, are supplied under pressure.

FLAME TEMPERATURE AND MIXTURE VELOCITY.

With regard to apparatus classified under (1), where it is generally found that the temperature head available for heat transfer is comparatively high, the calorific value of the gas employed does not materially affect the working efficiency, provided that modifications and adjustments of the apparatus are carried out to meet the new requirements brought-about by the change in form of the flame produced. This also applies generally to apparatus coming under the next three headings, with the exception of high-pressure gas systems employed in connection with the heating of combustion chambers where the primary aëration is carried out at the expense of the kinetic energy in the gas itself. With such apparatus, it will be found that if the calorific value of the gas used is reduced, difficulties will be experienced in maintaining the flame temperature originally obtained unless the mixture velocity is increased. In other words, modifications in the design of the injectors or combustion chambers, to enable the B.Th.U. equivalent of a lower-grade gas to be utilized, will not result in maintaining the original efficiencies unless the velocity of the mixture is increased.

A DIFFICULTY.

The difficulty referred to in obtaining sufficient concentration of combustion, and therefore high flame temperature, with the atmospheric form of burner with a lower-grade gas, manifests itself to a much greater extent in the case of apparatus that comes under classification (5). As in certain manufacturing districts furnaces falling within this category are likely to constitute a large percentage of the industrial load, special attention must be given both as to the effects of variations in the thermal concentration of the gas supplied for such apparatus, and secondly as to the possibilities of modifying the designs to enable same to be used with gas of higher or lower calorific value, as other requirements (such as the cost of production) may demand.

THE SO-CALLED REGENERATIVE FURNACE.

The well-known type of underfired, so-called regenerator, furnaces filled with atmospheric burners is typical of apparatus coming under this heading; and despite its comparatively low thermal efficiency of about 15 p.ct., it is found—from considerations of low first cost, simplicity of manipulation, ease of control, and speed of heating-up to working temperatures of 800° to 900° C.—to compete favourably with many other more efficient types of furnace of the countercurrent or recuperative variety on a cost-of-operation basis, especially in cases where the heating operation is not continuous. That furnaces of this type cannot be considered truly regenerative, in so far that in such designs no attempt is made at pre-heating by means of the waste gases, is apparent. At the same time, the pre-heating of the secondary air at the expense of the B.Th.U's. extracted from the heating chamber (which is the principle employed) is undoubtedly associated with the production of higher working temperatures and increased efficiency, owing to this pre-heating effect accelerating combustion, increasing the temperature head available for heat transfer, and consequently transferring to the load some of the heat which

would otherwise be lost by radiation in other parts of the furnace In the manufacturing districts of Birmingham, a very large number of furnaces of this type have been installed for such work as hardening, tempering, and re-heating, annealing, carburizing, low-temperature enamelling, and similar operations in which working temperatures up to 900° C. are required. Furnaces of this type are used to a considerable extent for such work as enamelling, annealing, and melting in the jewellery trades, and in many instances in small factories where the employment of fan draught, high-pressure gas, or air-blast types would be impossible owing to there being no power available for pressure raising.

MODIFICATIONS.

During certain periods of the war, when it became necessary to reduce the the calorific value of gas supplied, the difficulties which presented themselves were mainly in connection with furnaces of this type, with the result that a considerable amount of experimental work had to be carried out with a view to ascertaining to what extent such reduction in calorific value was possible, without materially affecting the output of manufacturing concerns employing such heating apparatus, and also to determining what modifications to existing plant were necessary to maintain as far as possible the efficiencies obtained with a gas of higher calorific value. With a drop of 50 B.Th.U's. in calorific value, the effect on the working efficiency of furnaces of this type was particularly marked.

Substitution of larger nipples, to enable the B.Th.U. equivalent of the lower-grade gas to be consumed, was attended with considerable prolongation of the heating operation, a lower concentration of combustion, lower available temperature head for heat transfer, and consequent lower thermal efficiency. Modifications in the dimensions of combustion chambers and the employment of more efficient forms of injectors were attended with but slight increases in efficiency; but where it was found possible to increase the mixture velocity, either by increasing the pressure of gas at the injector or of the air by means of a pressure-raising device, the difficulties referred to were removed, provided that the B.Th.U. equivalent of the gas of lower calorific value was employed for the heating operation.

It would appear, therefore, that if from a consideration of manufacturing costs it should be found advisable to supply a gas of lower calorific value, most careful attention must be given in regard to the corresponding effects on the working efficiencies of apparatus as referred to above. In many cases it would be possible to convert such apparatus to fan-draught, high-pressure gas, air-blast, or air-gas systems, and in this manner overcome most of the difficulties experienced with the type when a low calorific value gas is employed. But this will not always be possible owing to the requisite power for raising the pressure of the gas or air not always being available on the consumer's premises.

AN UNDERTAKING'S RESPONSIBILITY.

The above, while representing the experience of the writer in connection with this particular type of apparatus, is sufficient to show that though the Gas Regulation Act (1920) provides, as it should do, for contingencies such as have been referred to, by leaving in the hands of the supplier the decision of what calorific value gas is to be supplied, it at the same time places upon the undertaking not only the responsibility of supplying to the consumer the therms paid for, but the further moral responsibility of supplying these heat units at such a thermal concentration as will enable the consumer to use them in an efficient manner in his existing apparatus. While the Act does not apparently place upon the undertaking the responsibility of altering or replacing existing apparatus to suit the calorific value it may originally declare, it is highly improbable that any gas undertaking would, in the first place, declare a value which did not suit the immediate requirements of apparatus already existing within its area of supply. Such a policy might entail considerable expenditure on the part of certain consumers in modifying their plant to meet the new conditions.

Examinations in Gas Engineering and Gas Supply.

The Board of Education having, at the request of the Institution of Gas Engineers, consented to the examinations of the City and Guilds of London Institute in Grade I. of "Gas Engineering" and in Grade I. of "Gas Supply" being held in England and Wales this year, intending candidates should apply before March 9 to the Secretary of the Local Technical School, or to the Local Education Authority, in order that their names may be entered for the examinations at the centre at which they wish to be examined. The date of the examination in "Gas Engineering" is Saturday, April 23, and in "Gas Supply" Saturday, May 7—the hours of examination being 2.30 to 6.30 p.m. in each case.

Yorkshire Junior Gas Association.—On Saturday last, the Association held an informal meeting at the Gas Department Show-Rooms, Darley Street, Bradford (by permission of the Engineer and Manager, Mr. Charles Wood). Considering the counter-attraction at Leeds, there was a splendid attendance. Mr. A. Coe (Elland) opened a discussion on "Pitched Hydraulics and Stopped Ascension-Pipes." Those present entered keenly into the discussion; and the meeting was a great success.

ELECTRICITY SUPPLY MEMORANDA.

OUR journalistic contemporary, the "Electrical Review," is deeply disappointed over the two joint authority inquiries that first took place, to which attention has been previously given in the "Memoranda." Both inquiries show division among the local electricity suppliers, and incompleteness of information necessary to judgment. Our good friend speaks plainly and sharply to all the authorities concerned, and reproaches them with continued parochialism, and disloyalty to the industry, and to the understanding which led to the abandonment by the Government of the compulsory powers and the District Boards which were in the original Electricity Supply Bill of 1919, as well as in the resuscitated clauses which formed the defunct No. 2 Bill, but which do not now appear in the revised No. 2 Bill. It was thought that the industry had accepted the principle of joint electricity authorities invested with less drastic powers than those with which it was initially proposed to invest the District Boards. The want of unity and the bulky presence of dissension, and the inability to give anything of a definite nature to assist the Electricity Commissioners to a determination as to whether a combined scheme of generation or the extension of existing plants will prove the more economical, appear to be rendering the whole position ludicrous; and the Electricity Commissioners are feeling an impotence which ill fits the dignity of a Government department. Well, the "Review" is disappointed; and it seems to think that what is against perfect unity in this matter is intense jealousy. Jealousy never had good cohesive properties; but we do not think that this is so much what is wrong as something else. Jealousy is the most superficial and so the most easily detected of reasons for what is happening; but there is another.

Bitter Disappointment.

In the Dark.

There is all this scheming and planning before there has been a thorough investigation as to what can be done, and what it may be expected with fair confidence will result. It is easy enough to accept the generalization that economy will issue from splitting generation from the business of local distribution and sale—by creating a breach between those who distribute and sell and those who produce. But some people prefer to see acceptable guarantees. In most parts of the commercial world, it is the view that, if "production, distribution, and sale direct" to the consumer is a feasible combination, there is ultimate economy in it. The plans for the development of the electricity industry take a directly contrary course. And the more time the present producers and distributors have for consideration, the more doubts develop in conviction that there is much that is chimerical about the new schemes for the development of the industry, and clothing it in greater economy. They want to know more as to the certainty of financial success—what it is all going to cost, what are the economies and the counter uneconomies that will issue from the new order of things, and how does the balance (whether of economy or otherwise) stand in relation to development along present lines. They do not know anything definite. What they do know is that money is dear, so is plant, materials, and labour, and that the new proposals will place upon the electricity industry a good deal more administrative and executive machinery for its working. It is in all this that the cause of division of opinion and therefore of inaction lies. But the "Review" in its upbraidings seems to take it for granted that, given joint authorities, all will be well. We get this in two ways: First, our contemporary tells those concerned that if they do not of their own volition come into the joint authority schemes, then the Electricity Commissioners will have to say they have failed under the voluntary system, and ask Parliament for (as we understand our friend) the necessary compulsory powers; and, secondly, the picturesque language which it addresses to Provisional Order Companies shows great faith in the fruits of things yet unborn. These companies "could take a course which would make their latter years brighter than the former. Nay, it is conceivable that they could lengthen their life, and make it worth living. Is there no vision, no imagination among them?"

Manufacturers and Loans for Power Supply.

It may be supposed that the manufacturers of Birmingham know their own business, and can gauge pretty well whether it is a matter of life or death to them to assist the Corporation with funds for extending the Nechells electricity station. This matter is of general interest, because it arises out of a recommendation of the Finance Committee that the electricity extension scheme, among other projects, should be hung-up until the times are easier in respect of finance. The City Council agreed. Now members of the local Chamber of Commerce have been approached by the Chairman of the Electricity Committee (Mr. H. K. Beale); but they do not appear to be much interested or over-enthusiastic regarding the finding of money at 6 p.ct. for electricity works extensions. From what we know of the conditions of trade in Birmingham, there are many more important things to be attended to than the supply of money at 6 p.ct. for spending on the electricity station. However, though the Corporation are of opinion

that the matter of extensions can profitably wait, and the manufacturers represented by the Chamber of Commerce do not seem disposed to furnish the requisite funds for providing more electric energy at the present time, "Electrical Industries" is of opinion that all these worthies do not know their own business and needs, and so are altogether on the wrong tack. We discussed this matter of the manufacturers providing funds at the time Mr. George Cadbury originally made the suggestion. Evidently Mr. Beale thought there was something in the idea, and so went to the Chamber of Commerce to place the matter before them. From what he said, something like 75 p.ct. of the output of the electricity works is required by the manufacturers; and only 25 p.ct. meets the requirements of all the lighting, small power supplies, and the tramways. To-day unsatisfied applications for new supplies aggregating 45,000 H.P. are on the books. This led Mr. Beale to refer to the proposal as to financing by the manufacturers; and he stated that, if a million pounds were forthcoming, the department would be able to comply with all demands. There were no signs of a great enthusiasm to respond to the suggestion. One speaker pointed out (as we did on a previous occasion) that manufacturers could not afford to lend the Corporation money at 6 p.ct. when they could not themselves borrow on such low terms. Even if they could subscribe the money, they would want stricter control over the funds than the Corporation would be prepared to give them. So this attempt has failed. Meanwhile, the Council have sanctioned a modified scheme of extension at the station.

Electric Prepayment Meter Exodus.

We do not hear much about prepayment meter supplies in connection with electricity. Electric prepayment meters are expensive things; and with the installation costs on the premises, the additional charge beyond the price per unit makes this form of supply altogether prohibitive. Hence the idea in some cases of a fixed charge per light, and no meter. Where a few prepayment meters have survived, the new order of charge per unit has resulted in economies on the part of users that have made electricity suppliers look upon this branch as anything but a lucrative one; and combined with the trouble the meters give, it is a happy relief to get rid of them. We see that the Electricity Committee of the Colchester Corporation have come to the conclusion to abolish such meters, and to change them over to the ordinary type.

Lamp Quality and Prices.

The quality of lamps continues to supply interesting topic to the correspondence columns of the "Electrical Review," and accompanying it now is the question of the reduction of lamp prices. Despite what has been said as to the depreciated quality of electric lamps, "Electrical Industries," in an article on the reduction of prices, says that "matters would have been very different as regards both the quality and prices of the lamps if the makers had not been organized." If there is any good foundation for the complaints as to quality, the statement of our contemporary might be construed to mean that the quality would have been worse than it has been, and the prices still higher. But, of course, as to quality, that is just what it does not intend to convey. The writer all through slaps the makers on the back for their benevolent action in reducing prices—just at a period when the days are beginning to draw out and "summer time" is fast approaching, and so sales will dwindle! It is all to the good, it says, that "the Association has been able to apply the reduction to all the stocks outstanding." But a correspondent of the "Review" has a robust grumble at the Association for allowing retailers to "pile up" their stocks at the old price, and then allow a 12½ p.ct. rebate for only the lamps invoiced in January. He wants to know what about the stocks still in hand that were purchased prior to January. However, that is a trade matter as to which there is some soreness. In explaining how it is makers are at this time able to reduce the price of lamps that obviously must have been made with the same costs operating for materials and labour as at the beginning of the winter, "Electrical Industries" says that the chief cost is labour—accounting, it is understood, for about 80 p.ct. of the expense of producing a lamp; and there has been no reduction in labour cost. The glory of the reduction is attributed to the increase of experience in the manufacture of lamps; and since the armistice, the makers have been able to bring into operation various improvements in organization and methods which were hung-up during the war. This sounds a bit thin; but it is the only reason for the reduction that has so far come under our observation. However, we had better turn to another subject, or the makers may think we are in agreement with the charges made some months ago by the Profiteering Committee.

The Retrospective Increase.

The electricity consumers of Kingston-on-Thames cannot get over, and evidently do not intend to do so quickly, the action of the Corporation in not only raising the price of current from 8d. to 1s. per unit, but in making the price retrospective to Sept. 30 last. A meeting called by the local Chamber of Commerce has roundly protested against the mistake in policy that has been made by the Electricity Committee and the Council. Of course, the excuse is that it is a matter of expediency, and that if the money is not obtained from people who have used the current, the deficiency will have to fall on the ratepayers. Poor ratepayers of Kingston! They have had to pay and pay to keep the concern in a solvent condition; but apparently the Corporation could not brace themselves up to continue making the non-electricity-consuming ratepayers partly pay for something that had been supplied to the others. One speaker at the meeting, referring to the retrospective increase, stated that traders considered it a dishonest thing for an article purchased at a certain price to be charged much more when the bill came in. But it is more dishonest year after year to make ratepayers pay for something they have not had. There was much feeling displayed at the meeting; and resolutions were passed, in one case calling upon the Corporation to rescind the motion making the charge retrospective, and in another protesting to the Ministry of Transport against sanctioning the retrospective charge. It was also stated that some of the large consumers are contemplating putting in private generating plants. If this is so, perhaps the Gas Company can induce them to adopt gas-driven sets.

Power from Refuse.

There has been some discussion in the "Review" upon electricity supply from surplus sources; and in the course of it, Mr. A. Hugh Seabrook has been telling the boastful electrical engineers a few home truths. He points out that, in spite of the great increase in the cost of coal, little effort appears to have been made to further its more economical utilization. The habit of passing costs on to consumers has become chronic. The only suggestion for amendment so far has been the super-power station with its ghastly 50 p.ct. waste of heat in the cooling water. Then he gives some illustrations of how waste fuel and heat are utilized, which puts the ordinary practices of the electrical engineer well out of court. These examples will also interest gas engineers. An almost ideal instance of conservation of fuel is to be found in a remote town in Essex, where a local timber works gasify their wood refuse, and have installed a gas-engine-driven electric plant. They generate nearly 1000 H.P., three-fifths of which goes out of the works to light the town and supply power to other industrial users. Not a ton of coal is burned; and over a period of ten years, it is found that 3 lbs. of this refuse produces a B.H.P.-hour. In another town the staple industry produces wood refuse in great quantities; and there, after considerable effort, the local power users have been induced to instal electric-motors, and practically give away their wood refuse. Some of the latter is burned under the boilers at the local power station. Mr. Seabrook would not quarrel with this arrangement provided the local electricity supply people had the intelligence to contract for the whole of the wood refuse, gasify it, and make the best use of it. But instead of this they burn it, and use about 15 lbs. per B.H.P.-hour instead of 3 lbs., and use quantities of coal in addition. Then Mr. Seabrook states that he has on hand at the present time plans for what he imagines will show some rather remarkable results in thermal efficiency. The plant will consist of a steam electric power station for the manufacture of cyanamide for a group of sugar growers, whose refineries will adjoin the power station and absorb the waste steam heat, some of which will be supplied above atmospheric pressure. One more example. The other day a central-station engineer told Mr. Seabrook with pride that he had brought his coal consumption down to 2¼ lbs. per KW.-hour. As his hearer had inspected a few days before a little 700-H.P. gas-pumping plant working on a wretched load factor, and doing a B.H.P.-hour on 0·9 lb. of coal, he could not work up much enthusiasm for the 2¼ lb. per KW.-hour.

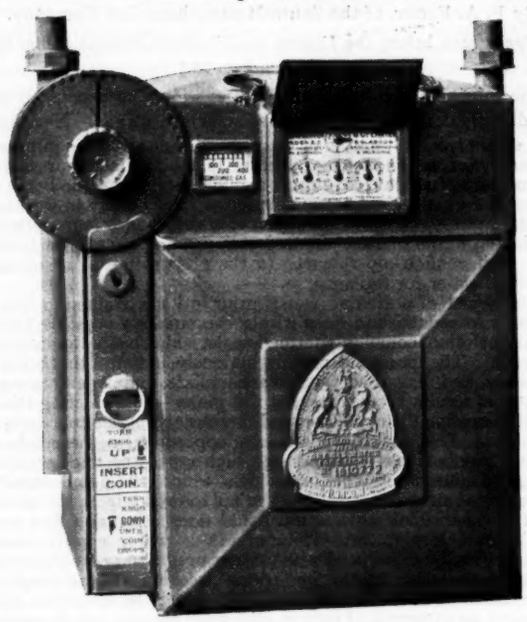
A British Standard Benzole Specification.—A British standard specification has been issued by the British Engineering Standards Association for "Benzol for Motor Fuel, commonly known as benzole, a benzene mixture." The specification includes a definition of the term "benzole," a description of the substance, and notes on its physical and chemical properties. These are followed by appendixes giving necessary tests, including that for the estimation of the sulphur content, with diagram; and the specification concludes with a description and illustration of the standard distillation apparatus. This subject has engaged the activities of the Association for some months past; and the Committee (under the chairmanship of Dr. G. Rudorf) have had the co-operation of a number of Government Departments and industrial and scientific organizations, including the National Benzole Association. The specification can be obtained from the Secretary of the British Engineering Standards Association, No. 28, Victoria Street, S.W. 1, price 1s. 2d. post free.

Dye Licences Advisory Committee.—Acting under the provisions of the Dyestuffs (Import) Regulation Act, 1920, the President of the Board of Trade has appointed a Committee to advise the Board with respect to the granting of licences under the Act. Among the members of the Committee are Mr. E. V. Evans, O.B.E., F.I.C., of the South Metropolitan Gas Company (Treasurer of the Society of Chemical Industry), Dr. M. O. Forster, F.R.S., F.I.C. (the Director of the Salter Institute of Industrial Chemistry), Mr. S. A. H. Whetmore (British Dyestuffs Corporation, Ltd.) and Mr. W. J. U. Woolcock, C.B.E., M.P. (General Manager of the Association of British Chemical Manufacturers). Pending the appointment of a permanent Chairman, Mr. Percy Ashley, Assistant Secretary of the Industries and Manufactures Department, Board of Trade, will act as Chairman. The Secretary is Mr. W. Graham, M.B.E.; and all applications for licences should be addressed to the Secretary, Dyestuffs Advisory Licensing Committee, Danlee Buildings, Spring Gardens, Manchester.

THOMAS GLOVER & CO.'S "STANDARD" PREPAYMENT METER.

THE ubiquity of the prepayment meter provides striking testimony to the correctness of the mechanical design of the present-day standard type, the principles of which were first embodied in the Thomas Glover & Co. meter nearly thirty years ago. The primary feature of this prepayment meter, which was produced in the old Clerkenwell works of the firm so many years ago, is to be found in the integral price-changing device. The introduction of this device marked the beginning of the revolution—now almost completed—in the price-changing methods which had obtained, in that it permitted the price of gas to be altered *in situ*, without the use of change-wheels or loose parts of any description. In recent years, the price of gas has had to be altered much more frequently than was the case in the pre-war period; and users of the Thomas Glover & Co. meter have congratulated themselves upon the economy and expedition with which they were able to effect the necessary changes. Patents, of course, cannot be held indefinitely; and, in view of the great success of this price-changer and the inconvenience, delays, and expense attendant upon other methods, it was in the natural order of things that, when these patents ran out, the essential features should be adopted as a standard, at first gradually and in progressive circles, and latterly almost throughout the industry.

However, Messrs. Thomas Glover & Co., Ltd., have not been resting on their laurels, but developed the original invention, and introduced improvements from time to time. One of these is to be found in what is now known throughout the trade as the "Yeovil Band." This meter patent was the first of its kind, in so



The "Standard" Prepayment Meter.

far as it abolished the use of sealing wax and screws for fastening the prepayment attachment. Other patents have had for their subject-matter fraud-proof devices. These have been embodied in the meter, and prevent the prepayment mechanism being actuated when the coin-slot is open. Another feature is the prepayment valve, which is housed in a separate chamber. This valve opens full on inserting the first coin, and positively shuts-off immediately the prepaid gas has been consumed, thus overcoming the difficulties which are sometimes experienced in this connection—viz.: (1) That the consumer does not obtain the full amount of gas for his first coin; or (2) that unpaid-for gas is allowed to pass in varying volume, owing to the vacillating action of the valve.

Realizing the obligations laid upon them as pioneers, the firm are constantly experimenting to improve and simplify the prepayment meter, and to increase its usefulness both to gas undertakings and to the public. The latest published development of the Thomas Glover & Co. meter is covered by provisional patents, and provides, among other things, for the alternative positioning of the prepayment attachment. This is now supplied in a conveniently accessible position on the front of the meter. During the past two years, this type has been tried and tested under every conceivable condition, and has received the approval of the gas undertakings to whom it has been supplied.

There is no radical alteration in the original price-changing device, the operation of which is simplicity itself. This is a point which will doubtless be duly appreciated by collectors, as they will not be under the necessity—which sometimes arises when new patterns are introduced—of mastering an entirely new set of instructions for the adjustment of the price mechanism. The price-changing disc is firmly secured at two points; it provides for a wide variation in the number of c.ft. per coin; and the hook-fastening makes it impossible for the price to be altered accidentally. The price-changer is automatically locked by the closing of the cash-box, or, alternatively, by a quarter-turn of the padlock hasp.

The prepayment mechanism can be operated only by coins of the correct currency. Smaller coins—such as a halfpenny in the case of a penny meter, or sixpence in the case of a shilling meter—do not stick in the mechanism, but pass ineffectually into the cash-box. The cash-box itself has ample accommodation, and is also accessible from the front of the meter. The coin-slot is closed, except when the coin-pocket is in position to receive the coin; and when in this position, the prepayment mechanism cannot be actuated fraudulently by any tool. The mechanism can be converted for use with pennies instead of shillings, or other coins, and *vice versa*. The conversion is effected by the mere addition of an attachment to the movement, and does not necessitate any alteration to the case-work. The prepayment mechanism is of the Thomas Glover & Co. standard two-worm spindle design. The firm's unique experience in making gun parts and other munitions with the greatest possible degree of accuracy, by the aid of jigs and other precision-devices, has been utilized in securing absolute interchangeability of parts.

As in other prepayment meters, no change-wheels, loose parts, or sealing-wax are required; and the price of gas can be altered *in situ* with even greater expedition than before. The amount of unconsumed gas is clearly shown on a dial in front of the meter. The positive shut-off valve has already been mentioned. The diaphragms are of the disc type, made of carefully selected skins, and banded-on in the correct Thomas Glover & Co. manner, without being subjected to the detrimental scorching influence of the hot soldering-iron. The leather is seamless, being cut out of the skin in one piece. One end of the securing band is undercut to house the projecting tongue of the other end, and to ensure even pressure along the entire circumference of the rim.

In conclusion, it may be said that Messrs. Thomas Glover & Co., as the original makers of the dry meter, with a manufacturing experience of over 77 years, have taken the utmost care to ensure that their new type of prepayment meter will maintain their reputation for strength, reliability, and general excellence.

PERSONAL.

A portrait of Mr. R. W. FOOT appears in the current issue of the "Co-Partners' Magazine of the Gas Light and Coke Company," with a few particulars of his career. Born in 1889, he was educated at Winchester College, and became a Solicitor in 1913. On the outbreak of war, he was given a Commission in the Royal Field Artillery, serving in France and Flanders from 1915 until the end, and obtaining the Military Cross and the O.B.E. (Military Division). In April, 1919, Mr. Foot entered the service of the Company as Assistant Secretary, becoming Solicitor as well in July, 1920. On his appointment as Assistant Manager last December, he ceased to act as Assistant Secretary but retains his office of Solicitor.

It is understood that the Stafford Gas and Electricity Committee have decided to recommend the appointment of Mr. THOMAS POULSON, the present Assistant Manager of the Gas-Works, as successor to Mr. W. M. Valon. The recommendation will be considered at the next meeting of the Town Council. Mr. Poulson, who is well qualified in every way for the post, is the eldest son of the late Mr. Arthur Poulson, who for many years held the position of Works Superintendent.

The resignation is announced of Mr. E. F. SMALLBONE, a Senior Assistant Engineer at the Beckton works of the Gas Light and Coke Company.

OBITUARY.

The death has taken place of Mr. THOMAS PEACOCK, who had been Manager to the Carluke Gas Company for 34 years.

At the age of 91, the death has occurred of Dr. WILLIAM ODLING, F.R.S., who for the long period of forty years held the Waynflete Professorship of Chemistry at Oxford. In times gone by, his name was a familiar one to "JOURNAL" readers—more, however, from his connection with water matters [which were then dealt with in our pages] than with gas. Dr. Odling became successively Fellow, Secretary, and President of the Chemical Society, and was the last survivor of the six ex-Presidents who, in recognition of having been Fellows for half-a-century, were entertained by the Society at a banquet in 1898. Several works on chemistry were from his pen; and it is recognized that his early work was an important factor in the development of modern chemistry.

At a sessional meeting of the Royal Sanitary Institute, to be held in the Royal College of Technology, Manchester, at 7 p.m., next Friday, discussions will take place on the "Use of Open Fires for Domestic Heating," by Dr. Margaret Fishenden; the "Present Position of Smokeless Fires," by Captain F. S. Sinnatt, M.B.E., M.Sc., F.I.C.; and "Air Pollution," by Prof. J. Radcliffe, M.Sc. (Tech.).

CATALYSIS IN INDUSTRIAL CHEMISTRY.

The first of a series of three Cantor Lectures dealing with "Applications of Catalysis to Industrial Chemistry" was delivered by Dr. ERIC K. RIDEAL, M.B.E., M.A., F.I.C., at the meeting of the Royal Society of Arts on Monday evening, Feb. 14. The following is a summary of the lecture.

The development of catalytic chemistry may be said to date to the time of alchemists, in their search for the Philosopher's Stone. The first scientific investigations, however, were conducted by Michael Faraday and Berzelius. Catalytic processes may be divided into three groups—homogeneous reactions, heterogeneous reactions, and those in which radiation exerts a catalytic action. Of these, the two former classes include all the technically important industrial processes; while the last-named is of great scientific interest.

In homogeneous reactions, the process of hydrolysis is one of the most important—being the basis of a large number of industries. As catalytic agents, acids are almost invariably employed. Several theories have been advanced to explain the mechanism by which an acid exerts its catalytic effect. The customary hypothesis that the catalytic activity of an acid is proportional to its hydrogen ion concentration has recently been shown to be untenable; and it has been suggested that the undissociated molecules may be catalytically active. It is, however, more probable that the activity of an acid is not conditioned entirely by its concentration, but by its concentration and its environment. The chemical activity of a solution embraces both these factors. Applications of this principle to industrial purposes will doubtless be made use of in reactions which proceed but slowly under normal conditions.

In heterogeneous reactions, many industrial applications are to be found; one example being the synthesis of ammonia. The older theories of Wöhler postulating the existence of definite intermediate compounds have now been rejected; and the concept of molecular orientation in processes of adsorption has proved of great utility in visualizing the reaction mechanism taking place at surfaces. That adsorption compounds exist, and that the molecules are orientated, is definitely supported by experimental evidence in the phenomenon of surface tension.

The rate of a chemical reaction taking place at a catalytic surface may be limited by the velocity of diffusion of the reactants and products to and from the surface; but in gases—and especially under low pressures—a direct measure of the rate of catalysis may be obtained. The rate of the reaction is governed to a great extent, not only by the pressure, the temperature, and the molecular weights of the reactants, but also by the lengths of the lives of the molecules on the surface. A molecule striking a surface is adsorbed, and remains on the surface for a definite period of time before it vaporizes or flies off again. Catalytic poisons are formed when the adsorption compound is very stable—*i.e.*, when the life of the poison molecule or atom on the surface is very long.

Heterogeneous catalysts show enhanced activity when small quantities of other substances, termed promoters, are admixed with them. It is suggested that promoters function by increasing the active surface of the catalyst. Adjustment of the relative lifetimes of the reactants on the surface of the catalyst may also account in part for promoter action. The design of technical plant for heterogeneous reactions requires great care in the calculation of the flow rate of the reactants, the size of catalyst grain, and the various thermal data—such as the specific heats of the reactants and the heats of reaction.

One of the most mysterious features of these chemical reactions is that the rate of chemical reaction is far less than the number of molecular impacts; and we are as yet uncertain why particular molecules react on impact, and others do not. It is probable however that the reactivity of a molecule depends in great measure on its internal energy; and this internal energy can be augmented by the absorption of radiation of suitable frequency. The nature of the suitable radiation can be calculated with the aid of the quantum theory; and if further investigation results in confirmation of the promising experimental evidence already collected, the development of photo-chemical processes in industry will not long be delayed.

In a booklet issued by the South Metropolitan Gas Company it is pointed out that "Metro" furnaces and heating appliances [which were referred to last week in our article on the Efficiency Exhibition at Olympia] can be used with success in a number of industries and trades—a list of over twenty being given. The booklet, which comes from the Gas Power and Heat Service Department of the Company, shows why gaseous fuel is paramount for so many purposes. The Heat Service offered by the Company provides something more than the supply of gas. It embraces: (1) The supply of a high-grade gas of a constant heating value of 550 B.Th.U. per cubic foot. (2) Expert technical advice on its efficient application. (3) The design and construction of special apparatus when required. (4) A research laboratory for the investigation and study of heating problems. Evidence of the economies effected and the increase in production obtained by the adoption of gaseous fuel is at the disposal of all inquiring manufacturers; and emphasis is laid on the fact that details of processes are kept strictly confidential.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The February business meeting of the Association, which was held last Friday evening, at the Westminster Technical Institute, was devoted to short papers and long discussions. The President (Mr. F. J. Pearce, of the North Middlesex Gas Company) was in the chair.

There were three papers submitted; and it was arranged that the reading of each should not occupy more than twenty minutes—the remainder of the time at the disposal of the meeting to be devoted to discussion. The authors kept within their allotted time; and the discussions were of a keen and very helpful character. In fact, the programme was voted a great success by all who took part in the proceedings. "It is one of the most interesting meetings we have had," declared the President.

The papers, and some notes of the discussions (which were largely of a conversational and informal character) will be found elsewhere in this issue. The subjects were: "Notes on Water Softening for Boilers," by Mr. F. A. Frost; "Syphon Pumping on Gas-Works," by Mr. D. C. Cross; and "Machines for Charging and Discharging Horizontal Through Retorts," by Mr. W. Grogono. At the close of the meeting the authors were accorded a hearty vote of thanks, on the proposition of the President, seconded by Mr. L. Lacey.

NOTES ON WATER SOFTENING FOR BOILERS.

By F. A. FROST, of the South Metropolitan Gas Company.

[A Paper read before the London and Southern District Junior Gas Association, Feb. 18.]

The subject I have selected for discussion this evening is not one directly concerned with the manufacture of gas. Nevertheless, steam-raising plant is of great importance in the equipment necessary for its conduct, and, further, is plant which incurs heavy expenditure of money; so that too much care cannot be taken to secure the greatest efficiency coupled with economy in working. To attempt to deal with the subject of steam-raising in its entirety within the limits of time allotted this evening, would be futile; so I shall confine my remarks to the preparation of a suitable supply of water for the purpose.

The object of softening water, prior to its introduction into a boiler, is to reduce and keep within the smallest possible limits the incrustation, commonly termed scale, which coats the internal surfaces. The presence of this seriously impairs the boiler's efficiency, and may, if allowed to accumulate, unduly lead to such disastrous results as overheating the plates—so deflecting them, possibly causing their collapse, and thereby giving rise to a serious explosion. This possibility is always uppermost in the minds of those whose business it is to design such apparatus, and results in ruling-out as impracticable many ideas which, while undoubtedly increasing their efficiency, would be far too risky from the safety point of view, which always must and does command first consideration. Only in rare instances is a water supply ready to hand which can be used without any preliminary treatment to minimize the effect of the impurities present; and although in some cases the scale-forming constituents may be absent to such an extent as to permit of its use, others are present which require special treatment to effect their removal. With these, however, we need not concern ourselves—they being mostly of an acid nature, set-up by contamination with such substances as peat, and for obvious reasons are best left in the hands of an expert.

As most of you probably know, the scale-forming impurities of water are the salts of calcium and magnesium. These exist both as carbonates and sulphates, the former being our primary concern; and while they are not in themselves soluble in water to any appreciable extent, they readily become so in the presence of carbonic acid, which is always the case. The removal of the latter, however, brings about their precipitation, and enables us to effect their removal, prior to introducing the water into the boiler. I do not propose to weary you with a recital of the various equations showing the chemical reactions which take place, some knowledge of chemistry being necessary in order to understand them thoroughly, while those of you possessing this knowledge can always refer to text books dealing with the subject.

The method almost universally used to-day for softening water is practically on the lines laid down by Prof. Clark, who, many years ago, investigated the subject very thoroughly, and devised the process which to-day bears his name. Described in popular language, the carbonates of calcium and magnesium, held in solution by the presence of carbonic acid, are precipitated by removing the latter by the addition of caustic lime, which converts it into carbonate of lime, when both the carbonates originally present, together with those formed by the combination of the caustic lime with the carbonic acid, precipitate out, and are then removed by settlement and filtration. The remaining salts to be dealt with are the sulphates of lime and magnesia, which on treatment with soda ash are converted into sulphates which are freely soluble, the concentration of which is kept within

limits by periodically blowing-out some portion of the water present in the boiler. The insoluble carbonates formed in this reaction are also removed by filtration.

In practice these two processes are combined, it being desirable to do so for many reasons; and, while the intermediate reactions are more complicated than the ones just described, the ultimate results are the same. The lime used should always be of the best quality obtainable—that of the fat or white variety (containing the highest percentage of active material) being the most suitable. Proper air-tight receptacles must be provided for its storage, bearing in mind the readiness with which it absorbs moisture and carbonic acid from the air, thereby increasing its weight and adding to the inert matter already present, which necessitates corrections in order to give the exact amount of active material to be used. The soda employed is that known commercially as soda ash (which is carbonate of soda), the variety containing the equivalent of 58 p.ct. of free alkali being best for the purpose. This must be kept in a dry place—it being particularly liable, if it gets damp, to cake in hard masses, which have to be crushed to facilitate handling, as well as for its ultimate solution.

For carrying out these processes, there are many types of apparatus on the market, which, generally speaking, are designed to give, by automatic means, a continuous supply of water of standard purity. To effect this, many ingenious devices are embodied at various points; and while appearing somewhat complicated for reliable working, yet they are not so in practice, provided the necessary attention is given to them. This is of the utmost importance, as with processes of this nature the gradual coating of the surfaces and pipe connections of the apparatus with sedimented material is bound to occur, resulting in restriction of the normal rate of flow of the reagents, and thus throwing the whole process out of balance. Equally good results may be obtained by home-made apparatus; and, from time to time, one meets with many examples showing what can be accomplished in this manner, provided that at the outset those attempting it possess a thorough knowledge of the nature of the operations carried on, as well as the pitfalls to be avoided, if the best results are to be obtained. The simplest form of apparatus consists of two tanks of equal capacity and preferably of such a size as to give a twelve-hour supply of the treated water in each case, this period being ample to allow of the preparation of the water and the subsequent settlement of the precipitated solids, the best form of tank being one having as large an area as possible with a minimum of depth. This, however, is not always practicable owing to considerations of the ground space required; and recourse may be made to cylindrical vessels placed on end. The disadvantages of this type may be overcome by arranging externally a series of off-takes, to permit of the water being drawn-off at different levels where it is clear without having to wait for the complete settlement of the solids throughout its depths. This arrangement, however, requires close attention, and may be overcome by employing some type of float-valve, fitted so as to draw-off the water just beneath the surface—thus maintaining a supply to the filter of water tolerably clear of suspended matter, and so lessening the amount of work to be performed by that part of the apparatus, and maintaining its efficiency throughout a very much longer period.

To prepare a charge of water, it is best to fit up a small circular tank at the ground level, into which the requisite quantities of reagents are introduced with a sufficiency of water to admit of their being well stirred and pumped into a similar-sized vessel superimposed on the two sedimenting tanks, from which they are allowed to intermingle with the water to be treated when run in, and are made-up with the latter to the correct volume. To expedite sedimentation, it is advisable to leave in the tank some portion of the sludge from the previous operation, which must be well incorporated with the fresh charge by agitating the whole with live steam or compressed air (should it be available). After this operation, the contents must be allowed to rest, until such time as sedimentation has proceeded to such a depth as to permit of clear water being drawn-off for use. These two operations may now proceed simultaneously, without, at any time, drawing-off turbid water, providing the tank is of sufficient capacity to meet the demand upon it.

The construction of a suitable and efficient filter is quite a simple matter. Such an apparatus may be improvized by using a length of steel tube or cast-iron main placed on end, the base being capped-up and a flange joint provided at the top, to permit filling, &c., the height of same being limited by that at which the settling tanks are placed above the ground, in order that the contents may gravitate through. The connections should be arranged so that the water passes in an upward direction; the grid supporting the filtering medium being fixed well above the floor level, and the water introduced just beneath it. The pocket thus formed will become a receptacle into which more or less of the suspended matter in the water will settle, and may be run-off periodically through the valve provided for washing-out the apparatus. The simplest forms of filtering medium are sand, quartz, breeze, and wood wool; the latter being a particularly serviceable material, provided the packing is carefully done, and it is then covered over by a perforated grid securely fastened down to prevent small particles of wood being carried off with the filtered water. The cylinder should be packed to within an inch or two from the top, and an outlet for the water provided just beneath the cover-plate, to convey it to the feed tank fitted with a ball-valve to regulate the stream of water in accordance with requirements. Further connections must be arranged to permit of flushing-out from time to time, which is best accomplished by passing a good stream of water in the reverse direction to remove the accumulation at the base of the filtering medium, as well as that which has settled in the pocket. Attention to these details will maintain filters in an efficient condition over a long period without re-packing.

In order to obtain the best results from any plant, the importance of intelligent supervision cannot be too strongly emphasized. Too often does one find the conduct of operations being left entirely to the boiler fireman, who, with plenty of other work on hand, may or may not make the periodical inspection of the apparatus necessary to ensure that all is in order. To maintain efficiency, the cleansing of these parts must be carried out regularly, without waiting for the water tests to indicate their condition. Be wise before the event, and not after; and you will be amply repaid when the time comes along for chipping and inspection. Further, the quantities of the reagents to be used should be carefully weighed, and some responsible person be instructed to see that they are introduced into the apparatus. Soda ash, it is well to remember, is a useful commodity, and is apt to get used in ways other than intended, to the detriment of the results obtained.

Tests for alkalinity, as well as hardness, are necessary; it being well known that alkaline waters are particularly liable to cause grooving of the boiler plates. Attention to these details will save both time and money. It is well to bear in mind the reasons and the necessity for this work, for with imperfectly softened water the more frequent laying-off of boilers for scaling is inevitable; considerable losses of heat transference occur owing to the presence of scale; and the working life of the boilers is much reduced by the frequency of chipping, their surface after this operation being roughened to such an extent as to accelerate scale deposition when next put into action.

DISCUSSION.

The PRESIDENT (Mr F. J. Pearce) remarked that Mr. Frost had given them a good opening upon which to base a discussion. He very rightly said that the question of the treatment of water for the supply of boiler plant was of the utmost importance, because upon the attention which was given to the water supply depended, not only the efficiency of the boilers, but also the cost of maintenance, which included scaling. At the present time, at any rate, this was a very expensive matter, if one was troubled with a lot of scale. It was not altogether the thickness of the scale which caused the trouble, but the hardness of it. A thin hard scale was often more difficult to remove than a thicker scale which was not so hard.

Mr. W. H. KERRIDGE (Croydon) remarked that, in addition to being of importance on the works, the question of water softening was also becoming very important to the district man. Great hardness of water naturally affected the water-heating appliances.

Mr. E. G. STEWART (Gas Light and Coke Company) said that at the Fulham works they were in the fortunate position of not having to use any means of softening their water; and he believed the same thing applied to the Lots Road power station which they recently visited. They used the same source of supply—namely, the London underground basin. He would like to hear the author's opinion as to "Permutit," and also his views on boiler fluids. Could he tell them anything about these nostrums which many people put in their boilers, and fancied they were doing good?

Mr. D. C. CROSS (Lea Bridge), referring to the remarks of Mr. Stewart, said that at Lea Bridge also they drew their water from a well, and had no softening apparatus; but they used boiler fluids. The first thing they did when they cleaned a boiler was to paint it with a special paint called "Scalene." The effect upon the boiler of this "Scalene" was tremendous. It took at least 60 p.ct. more time to clean a boiler without the "Scalene" than it did with it. Their boilers were cleaned by piecework; and they had an insurance inspector down afterwards, to make certain that it had been properly done. If the supply of "Scalene" happened to run out, and the boiler had to be got to work before this could be put on, there was grumbling from the piecework men. As far as boiler fluid was concerned, they had tried different boilers with different fluids; and in their case there was not the slightest doubt that they got a very beneficial effect from the boiler fluid. Using water that had been softened, how long would the author run a works boiler, going 24 hours a day? Without softening, and with a boiler fluid, he (the speaker) considered three months, at 24 hours a day, good working.

Mr. J. HEWETT (South Metropolitan Gas Company) said he was glad to hear the author try to impress upon them the importance of seeing that some responsible person attended to the softening of water. If water were a standard commodity, as gas was in some cases, they could do very well; but some years ago, when the Metropolitan Water Board came into existence, the different supplies were all merged into one, and nowadays one seldom knew what water he would be getting on the following morning. Therefore it was far more important now to supervise and proceed carefully.

Mr. ANDREWS (South Metropolitan Gas Company) asked whether the author had had any experience with "Graphite." In his case they had run with it for a period of some six weeks. The scale on the boiler at starting was about $\frac{1}{2}$ in. average. At the end of the six weeks' run, the boiler was dropped and opened-out; and it was found at the front end, where most heat played, the boiler was fairly free from scale—there being some indication that it was working backwards. In fact, the scale had come down in sheets. The hardness of the water was between 3° and 8°.

The PRESIDENT said he thought that Mr. Frost in his paper referred to the necessity of a water-softening plant being automatic in its action. He took it that, by automatic, he meant it was possible for the reagent to be made-up in a tank sufficient in quantity to last for a definite period—say, 24 hours—so that the making-up could be done

under the supervision of the chemist, and added automatically to the softening plant in proportion to the flow of water through it. He himself had had some experience with one type of water-softening plant in which it was necessary that the tank should be made-up about every eight hours, the result being that it was not always possible for this to be done under the supervision of the chemist. It had to be left to the workmen to do; and a little inattention on their part easily led to more water being spoiled than was softened.

Mr. FROST, in reply, said it was always very important, when the time came round for laying-off a boiler, to fill it up to the top with water, and then let the water off immediately before the men went inside to work. Every day this operation was delayed, the air, which was freely passing round the boiler, hardened the scale to a serious degree; and if the boiler was left empty for a week or ten days the period occupied in getting the scale off might be four or five times as long as if the men had gone in directly the boiler was emptied of water. When speaking of an automatic plant, one had in mind a continuous plant, with which the reagents could be mixed, as the President suggested had better be done, all at one time, and then left in a plant provided with automatic arrangements by which a certain proportion of the mixture passed into the water just as required. Having to mix every eight hours was very likely to lead one wrong, for the reason that Mr. Pearce had pointed out. As to hard water in circulators on the district, while it would no doubt be very advantageous always to have a supply of soft water for these boilers, this was impracticable. In some cases people might perhaps use with advantage one of the well-known boiler compositions—under expert advice always. There were many different types of boiler fluids on the market; and there was no secret about the composition of a number of them. The basis of nearly all that he had any knowledge of was soda in one form or another. The "Permutit" plant he had had no experience of. The effect that scaling had on the efficiency of a boiler was not always recognized. While round the furnace-tubes scale of only $\frac{1}{16}$ in. in thickness was capable of reducing the efficiency of heat transference by about 10 p.ct., if one got to $\frac{1}{4}$ in. the efficiency fell off by 25 or 30 p.ct., and with $\frac{1}{2}$ in. the loss could be as much as 60 p.ct. Boiler fluids were very expensive; and there was no cheaper method than the Clark softening process. Using boiler fluids and chipping every three months with a 24-hour boiler, he thought was a short time. He should prefer to go from six to eight months; and with good water softening and proper supervision, he should not expect to find any abnormal amount of scale after such a period. It was certainly very important that responsible people should look after the introducing of the reagents. He was not altogether sure that graphite did not enter into the composition of some of the boiler compounds. In some of them tannin extracts were used. The idea was to form some sort of coating on the plate to prevent the adhesion of scale. If one did this successfully, the scale fell to the bottom, and could be removed with the water flowing out. The cost of softening water by the Clark process to-day, for reagents alone, was just a little under 3d. per 1000 gallons. The labour involved was very small, and would not add more than one-tenth of a penny to this figure.

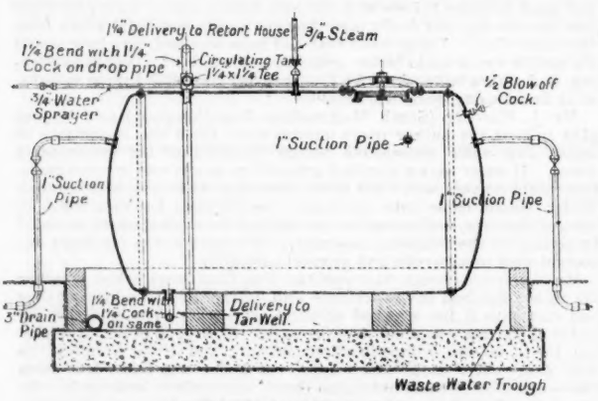
SYPHON PUMPING ON GAS-WORKS.

By D. C. CROSS, Assoc.M.Inst.C.E., of Lea Bridge.

[A Paper read on Feb. 18, before the London and Southern Junior Gas Association.]

I propose to give you this evening a short description of the method we have at Lea Bridge for emptying all our works syphons. In bringing the matter forward, I do not wish to claim anything original in our method; but, at the same time, it may be of interest to those who are pumping their syphons with the ordinary hand-pump.

The method consists of sucking or drawing the tar and liquor out of the gas syphons by means of a vacuum created in iron boiler tanks by the condensation of steam. All the coal gas and water gas syphons are treated in the same manner, by two separate boiler tanks quite apart from each other. These are



Syphon Suction Boiler-Tank.

of the same size, and consist of old wrought-iron cylindrical boiler tanks, 4 ft. in diameter, 7 ft. long, and $\frac{3}{8}$ in. thick. The capacity is 540 gallons. Each is placed on the ground level in a shallow brick trough, which carries to the drains the water used for condensation purposes. The reason we fixed them on the ground level was to allow them to be emptied by gravity into our tar wells. Separate suction pipes are run to each syphon, with a cock on each as close as possible to the tank, and entering it about 3 ft. above the ground level. At the syphon end, the connection is simply a T piece off the stand-pipe. We have found no necessity for a cock near the syphon, except in the case of the purifiers and some of the water gas syphons, where the same suction pipe is used for two or three purifiers, or two syphons, in which case an extra cock is inserted either on the bottom of each purifier, or on the outlet of the T on the stand-pipe. The size adopted for all suction pipes is 1 in., no matter the length.

A $\frac{3}{4}$-in. steam supply with valve is fitted to the top of the tank; and a $\frac{1}{2}$-in. air-vent is fitted into one end [see sketch]. There are two $1\frac{1}{4}$-in. delivery pipes—one a bend screwed into the bottom of the tank, through which the latter can be emptied by gravity into the tar well. The second delivery pipe rises from within $\frac{1}{2}$ in. of the bottom, and passes through the top, whence it is led to our retort-house liquor circulating tank. Both deliveries are controlled by iron cocks. Along the top of the suction tank is run a $\frac{1}{2}$-in. water spray, which allows cold water to flow down both sides to condense the steam. It is covered with sacking cloth to economize the water. We have placed our suction tank as near as possibly central to all the syphons. On the coal-gas section, the furthest purifier syphon suction is 100 ft., with a $6\frac{1}{2}$-ft. rise; while the longest length of suction pipe is 101 ft. on the inlet to the condenser main, with a total rise of 10 ft. 6 in., and also against the inlet of the exhauster vacuum.

It is interesting to note that although our condensers are some distance from the retort-house, when we were steaming our verticals to 25 lbs. nozzle pressure, we reached a temperature of 212° Fahr. on the condenser inlets, whereas when we reduced the steaming to 10 lbs., this temperature dropped to 145°. We experience no difficulty in drawing the tar and liquor from the inlet to condenser syphon, even when the temperature of the gas passing through is as high as 212°.

The use of this method is simple, clean, and efficient. First, steam is admitted into the top of the suction tank, and blows full-bore for two minutes. The air-cock is open, and allows the air in the tank to be blown-out. At the end of two minutes the air-cock is shut-off, and the steam allowed to accumulate in the tank for another minute, to heat it further. Then the steam is shut-off, and the water spray along the top turned-on to cool the sides. To hurry matters, the air-cock is again opened to release the surplus steam pressure, and shut just as the vacuum is reached. The operator then opens one of his suction cocks. The condensation of the steam creates a vacuum, and draws all the tar and liquor out of the syphon. Should the liquor be cool (as found anywhere after the outlet of the condensers), the cold liquor entering the tank quickens the condensation of the steam and so increases the vacuum. As soon as the syphon is empty, the cock is shut and another opened. When the tank has finished pulling, the water spray is shut-off, the air-cock opened, and the cock on the bottom delivery pipe opened, allowing the liquor and tar to drain into the well. As soon as it is empty, the bottom cock is shut, the steam turned-on, and the cycle restarted. The operator can tell when a syphon is empty either by putting his ear to the suction pipe and listening for the rush of liquor to be succeeded by the sound of gas bubbles, or by the feel of the pipe; for when the syphon is empty, the suction pipe has a distinct vibration. Further, to make certain that a syphon is completely empty, the operator can remove the caps from the top of the syphon stand-pipe, and satisfy himself that gas is blowing-out.

Two or three weeks ago, I temporarily fitted a gauge to the tank while it was in use. I found that the tar and liquor started to flow in when a vacuum of between 4 and 5 lbs. per sq. in. was reached. The highest vacuum registered that day was 8·8 lbs. per sq. in. When the tank stopped drawing after some twenty-five minutes, we still had a 4-lb. vacuum left. I dipped, and found we had 150 gallons, or about 28 p.ct. of its capacity.

A fair quantity of water is condensed in the bottom of our oxide purifiers. This is all drawn out by the suction tank; and the water, together with that drawn from the outlet of the purifier main syphons, is either run-away to the drain, or, by admitting steam, is forced to the retort-house liquor circulating tank through the $1\frac{1}{4}$-in. delivery pipe rising out of the top of the suction tank. The pressure used to force the water through the 233 ft. of delivery pipe, with a rise of 11 ft. 6 in., is about 12 lbs. per sq. in.

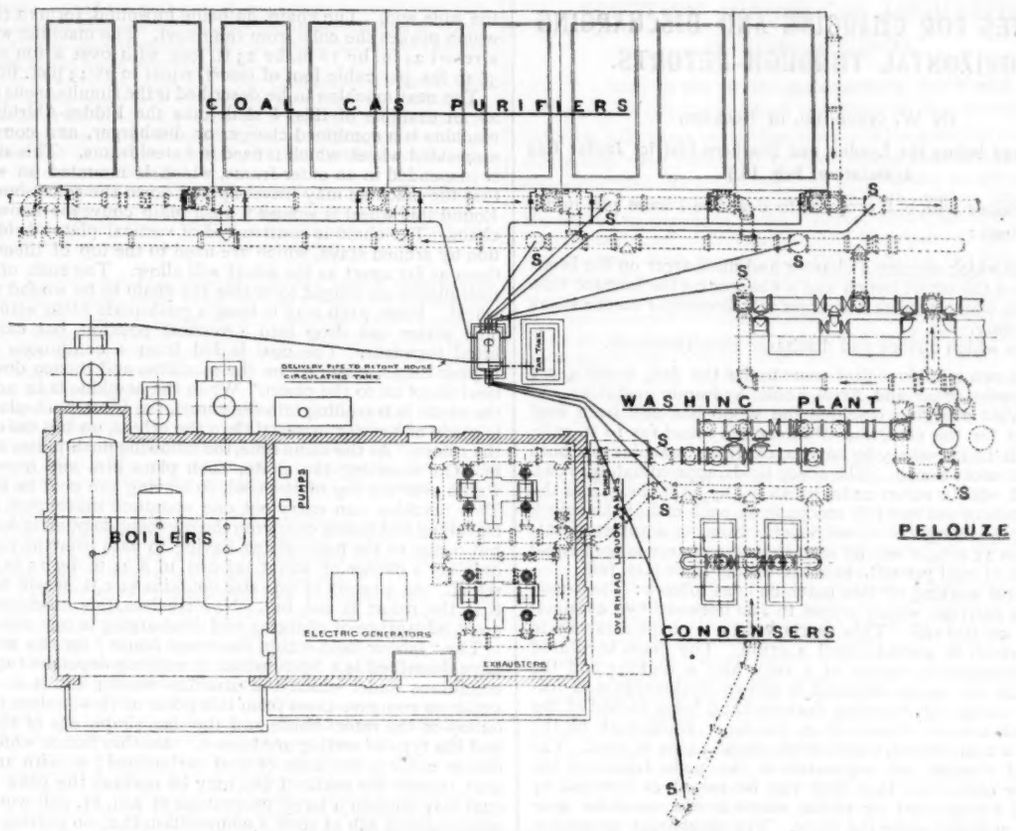
I should like to emphasize here that it is very necessary that ammoniacal liquor with any free ammonia in it should drain-out by gravity, and not be forced-out by naked steam pressure.

I measured the quantity of condensate made in our coal gas syphons in 24 hours last November, and again this month; the coal gas made being 1,640,000 c.ft. per day.

Inlet condenser syphon, gallons	336
Outlet " "	282
Outlet exhaust " "	224
Three other syphons before purifiers, gallons	56
Three syphons on outlet of purifiers "	42
Total for 24 hours, gallons	940

This does not include the condensate recovered from the bottom of the purifiers.

Our second suction tank is fitted-up in exactly the same way for clearing our water gas syphons. The water gas purifiers are also drained by it. For several years we have relied on it to



ARRANGEMENT OF SYPHON SUCTION PLANT.

draw all condensate from the syphons on the bottom of the inlet and outlet pipes of our relief holder. This will give you an idea of its drawing power. The distance between the tank and the holder is 165 ft., with a total lift of 17 ft. 6 in. The suction pipe is 1 in. diameter; and the vacuum registered while drawing this syphon was 7 lbs. per sq. in. During the war, while we had to make more water gas with totally inadequate condensing power, as a precaution we made arrangements whereby the two holder syphons could be emptied by ordinary hand-pumps into a barrel from which the light tar is drawn by the suction tank. The light water-gas tar obtained from all the syphons is forced by steam pressure through 246 ft. of 1¼-in. delivery pipe to our retort-house liquor tank, where it is circulated through the hydraulic mains, and helps to thin the thick coal tar.

The reason we have adopted the above system for clearing our syphons is first, because it is very simple, and in our case is being operated by elderly men. Then it is very clean—no sign of tar is to be seen anywhere round the syphons on the works. There is a distinct saving of labour, as one man will deal with far more condensate than he could if he used the hand-pump. I estimate a man can deal with 200 gallons of condensate per hour with a suction tank of our size. Throughout the war one man, working twelve hours per day, dealt with all the coal gas and water gas syphons up to the holder inlets, with a combined make of gas of over 2 million c.ft. per day. For the last two years we have worked two men 8 hours each per day; and the maximum total make of gas is over 3 millions. These two men could easily cope with the condensate from 4 millions of gas per day.

This method would not be of much use to large works, where the work could be done cheaper by mechanical means; but I have brought it before you this evening as a suggestion for medium and smaller works for dispensing with the slow and dirty method of emptying syphons by means of the hand-pump. Obviously it is only of use for syphons reasonably close to some central spot, and near a steam source. I find it takes about 40 lbs. weight of steam for each pull of the suction tank.

DISCUSSION.

The PRESIDENT (Mr. F. J. Pearce) said he had seen a method somewhat similar to the one Mr. Cross had described in use at other works, not relying though upon the condensation of steam, but with a small steam injector with which a vacuum was created in the suction tank. This, so far as he could see, worked very efficiently indeed. There was one thing in favour of the plan he had mentioned. It appeared to him that with it one got the greater vacuum necessary for emptying the syphons in a very much shorter time.

Mr. F. A. FROST (South Metropolitan Gas Company) said that the method described in the paper was a novel one to him for dealing with the problem of efficiently emptying the syphons; and it appealed to him very much. But were he adopting it, he should prefer a small vacuum pump, instead of the more cumbrous process of heating-up with steam, and allowing the steam to condense to create a vacuum. Such a pump could be very cheaply operated. He did not quite like the idea of relying upon the rule-of-thumb plan of listening for the sound of gas bubbles or feeling the pipe to tell when a syphon was empty. It was very important, to his mind, to always trust to dips. He was rather staggered to learn that at Lea Bridge the temperature of the gas entering the condensers was sometimes as high as 212°. He thought a small amount of steam was put into the retort to sweep out the gas rapidly and prevent any degradation. It was quite evident that at Lea Bridge large quantities of steam must be going forward as such into the condenser. He would like to know what amount of fuel the author used to heat his vertical retorts, though this, perhaps, was not altogether relevant to the paper.

Mr. C. WRIGHT (Gas Light and Coke Company) asked whether the steam could not be more effectively cooled by using Gaillard sprays. Also, what was the effect on the free ammonia in the liquor, as he thought the temperature of the condensate must be raised on entering the tank?

Mr. CROSS, replying, said Mr. Pearce had remarked that a steam injector would create more vacuum. He (the speaker) agreed; but he thought the figures quoted in the paper showed that his plan was less wasteful than an injector. He had heard it said that a steam injector was very wasteful. They preferred their method at Lea Bridge to the injector also because of its simplicity. Mr. Frost had suggested a vacuum pump. When the idea described in the paper was first started, the Lea Bridge Gas Company had outgrown several of their departments, and one of them was the fitting staff. The shops and everything were very incomplete; and they felt that if they could instal something without mechanical pumps, they should do so in preference to putting in a vacuum pump. The plant was operated by an old pensioner of over 65 years of age. He had attended to it for the past six years, and took great pride in it; and during the whole of this time, there had not been one moment's trouble with the arrangement. There were no working parts to get out of order. It was, of course, a plan that was suitable for a small works. With regard to the remarks about listening, they did dip at Lea Bridge at least once a week, to make certain there was no trouble; and also about twice a week the caps were taken off. There were however, two old men now on the plant; and they had got so efficient that it was impossible to catch them napping. He had expected some question to crop-up with regard to the temperature of the gas at the inlet of the condensers. It was remarked that with steaming one did get a rise of temperature of the gases. They did not, however, have a rise of CO_2. Even steaming their verticals, the inerts were nearly always under 12 p.ct. in their coal gas, mixed gas, and water gas. As far as the fuel used was concerned, he was not going into the controversial question of steaming verticals; but when they steamed their verticals at Lea Bridge, the increase of fuel was about 1 lb. per 100 lbs. used. A question had been asked as to having a water spray inside. He agreed that this would cool-down the steam; but it would weaken the liquor. It would give them more water to negotiate. With the high temperature of verticals, the condensers made a considerable amount of liquor, and it was always a difficulty to keep-up the strength. One did everything possible to keep water out. With regard to the temperature of the condensate, 100° would be about the maximum they got. The tar-well was carefully sealed; and they had never experienced any loss of ammonia from the rise in temperature.

MACHINES FOR CHARGING AND DISCHARGING HORIZONTAL THROUGH RETORTS.

By W. GROGONO, of Beckton.

[A Paper read before the London and Southern District Junior Gas Association, Feb. 18.]

The machines which I propose to describe I have put under three headings:

1.—Those which require a charger and discharger on the blank side of the retort-bench and a charger on the furnace side.
2.—Those which require a charger and discharger on the blank side only.
3.—Those which charge and discharge simultaneously.

The best-known machines that come under the first heading are West's compressed air and Arrol-Foulis hydraulic machines.

In the West charging machine the scoop has still been kept as a carrier for the coal, and it enters the retort for 10 ft. only. Therefore it is necessary to have a charging machine on both sides of the retort-bench. The scoop holds, approximately, 2 cwt. of coal, and with a retort 22 in. by 16 in. by 20 ft. long, it is the usual practice to put two full scoops in at each end of the retort, making a total charge of about 8 cwt. Now, as a retort of this size contains 41 c.ft., it will be seen that this charge is only equal to 21·85 lbs. of coal per c.ft., in other words, 44·88 p.ct. full.

The general working of this machine is as follows: The scoop is fixed to a carriage which is free to run between two channel-irons on a central rail. This carriage has a chain attached to each end, which is wound round a drum. The drum is rotated in either direction by means of a rack and a pinion; and the carriage with the scoop attached is drawn backwards and forwards—the scoop only entering the retort and being turned at the end of each travel. Attached to the inner framework of the machine is a coal-hopper, which holds about 2 tons of coal. The hopper and charger are supported in the main frame of the machine by chains, so that they can be raised or lowered by means of a compressed air motor, which is also used for propelling the machine along the stage. The discharger or pusher is built-up of a flexible and ridged chain, working in a moving case, and driven by a large tooth sprocket wheel geared-down from a compressed air reversing motor. The case and ridged chain are each made to travel 10 ft., so that a 20 ft. retort can be cleared of coke from one side of the bench. The machine is propelled along the retort-house stage by means of a separate motor; and 300 retorts can be easily drawn and charged by a set of three machines in eight hours.

The Arrol-Foulis hydraulic charging machine places the coal in the retort by means of a number of pushes carried out by the action of a bar fitted with a head or shovel—this being pulled backwards and forwards by chains attached to two rams. The coal is dropped in front of the shovel by a drum, which is rotated by a small ratchet and pawl, and is situated under the coal-hopper, which holds 2½ tons of coal. The number of pushes put in from each end of the retort can be arranged; and the amount of coal for each push may be varied to a certain degree. It will be seen that with this machine it is possible to fill a retort. The discharger is a telescopic hydraulic ram fitted with a head, and supported in a steel frame by chains attached to a ram, so that it can be lifted or lowered for the different tiers of retorts. The three machines will charge and discharge about the same number of retorts as the three West's machines in the same time.

For the second heading, I have taken both the De Brouwer and the Drake machines. The De Brouwer machine, which can be driven by electric current or compressed air, places the coal in the retort by means of a fast-running belt. This belt runs round three small plain pulleys, and under a large grooved wheel. The coal is fed at the back of the grooved pulley and along on the belt in a horizontal course, until the belt bends back round one of the small pulleys, when the coal continues in a straight line into the retort. The charge is governed by the speed of the belt, which is controlled on the electric machine by a rheostat, and on the compressed air machine by a small belt running on two cone-pulleys working a governor on the compressed air motor. This projector is hung in a steel frame by chains, and can be raised or lowered according to the tier of retorts to be charged. The machine can lay a charge of any size required. A discharger is worked on the same side of the house as the charger; and the two machines will charge and discharge a retort in the same time as the sets of three machines already described.

The Drake machine is another type which projects the coal into the retorts; but, instead of employing a fast-running belt, it achieves the same result by means of a paddle-wheel or rotor. The coal is fed through a telescopic shoot in two streams each side of the centre. The rotor is divided by cast-steel plates; and the coal is discharged in two streams which converge, forming a level charge which may be of any thickness desired. The machine is fitted with a separate electric motor for each movement, so that it is possible to travel and hoist at the same time. The discharger may be a separate machine, or it can be mounted on the same chassis as the charger; and it consists of a ram constructed of steel chain tapering towards the head end. This chain is wound round a drum; the narrow end of the chain resting in between the wide end. The chain, on being unwound, forms a ridged bar, which pushes the coke from the retort. The machine will charge a retort 24 in. by 18 in. by 23 ft. long with over a ton of coal, or 38·19 lbs. per cubic foot of retort, equal to 78·43 p.ct. full.

The next machine to be described is the simultaneous one; and as an example of this, I shall take the Fiddes-Aldridge. This machine is a combined charger or discharger, and consists of a nine-sided wheel, which is fixed in a steel frame. This steel frame is suspended in an outer frame, which is mounted on wheels, so that the machine may travel up and down the retort-house stage. Round this wheel is wound a push-plate conveyor known as the chain. The chain is constructed of vertical plates held in position by arched stays, which are fixed to the top of them, holding them as far apart as the retort will allow. The ends of the vertical plates are hinged to enable the chain to be wound round the wheel. From each stay is hung a push-plate fitted with a trigger. The plates can drop into a vertical position, but can only be lifted forwards. The coal is fed from a continuous overhead hopper into a chamber on the machine, and thence down a vertical shoot on to the chain. When the machine is in action and the chain is travelling into the retort, the front push-plate, which is made of heavier material than the others, pushes the coke from the retort. At the same time, the following push-plates carry coal in. On reversing the chain, each plate lifts and travels backwards over the top of the coal, so leaving the coal in the retort. This machine can carry out one complete movement, including travelling and taking coal from the overhead hopper, in 60 seconds; but owing to the push-plates having to pass over the coal, it will only lay a charge of about 12½ cwt. in a 24 in. by 15 in. by 20 ft. retort. As a retort of this size contains 51 c.ft., it will be noticed that the retort is not full. Nevertheless, this machine has the great advantage of charging and discharging in one movement.

The "labour cost within the retort-house" for the machines I have described is a figure which is entirely dependent upon local conditions under which the machine works; and it is therefore unfair to compare them from this point of view, unless the whole outlay of the retort-house and the size, shape, age of the retorts, and the type of setting are known. Another factor which affects labour costs is the class of coal carbonized; as with an inferior coal, though the make of gas may be normal, the coke from the coal may contain a large percentage of ash, or, still worse, a fair percentage of ash of such a composition that, on putting the coke into the furnace, trouble is experienced with clinker, and the temperature of the setting at once falls.

The result is obvious—namely, a smaller 24 hours' throughput of coal, owing to the duration of the charge being increased or the charge itself reduced. When a setting of retorts is being built, too much attention cannot be paid to the furnace, as to area and depth, as the whole working of the retort-house is dependent on having sufficient heating power to maintain the retorts at any desired temperature, and also an easy and rapid method of filling the furnace with hot coke from the retorts with a minimum of labour.

In conclusion, I would like to say that, in the short paper I have just read, I have not gone into the question of wear and tear or capital cost of any machine, but have tried to explain how a few of the best-known machines work, and some of the conditions which are essential for the efficient working of them. I have also appended a table of charges showing the fulness of the retort for different sized charges.

Table Showing the Fulness of Three Different Sized ⌂ Retorts in Common Use, with Various Sized Charges.

Size of Retort.	Cubical Capacity C.Ft.	Charge Cwt.	Lbs. per C.Ft.	P.Ct. Full.
22 in. by 16 in. by 20 ft.	41	8	21·85	44·88
" " "	"	9	24·58	50·48
" " "	"	10	27·32	56·11
" " "	"	11	30·05	61·72
" " "	"	12	32·78	67·32
24 in. by 18 in. by 20 ft.	51	10	21·96	45·10
" " "	"	11	24·16	49·61
" " "	"	12	26·35	54·11
" " "	"	13	28·55	58·62
" " "	"	14	30·70	63·12
24 in. by 18 in. by 23 ft.	58·65	12	22·91	47·05
" " "	"	13	24·82	50·97
" " "	"	14	26·73	54·90
" " "	"	15	28·64	58·82
" " "	"	16	30·55	62·75
" " "	"	17	32·46	66·67
" " "	"	18	34·37	70·69
" " "	"	19	36·28	74·51
" " "	"	20	38·19	78·43

DISCUSSION.

The PRESIDENT (Mr. F. J. Pearce) remarked that the subject dealt with in the paper was of the utmost interest to the works man, because there were comparatively few retort-houses nowadays in which a charging machine of some sort or another was not in use. With the Fiddes-Aldridge machine he had had considerable experience, and quite agreed with Mr. Grogono that it was an exceedingly good one. It would, however, be still better if it put more coal in. No doubt, some of them would say the Fiddes-Aldridge machine could be made

to fill the retorts. Had the author had any personal experience with the Fiddes-Aldridge machine brought out for filling the retorts, which had an internal conveyor running inside the chain that threw the coal into the retort as the chain was withdrawn?

Mr. E. G. STEWART (Gas Light and Coke Company) said he had had experience of nearly every type of machine mentioned by the author; and he referred to the good work done by a Fiddes-Aldridge machine at Fulham, which was one of the earliest put in. He asked the author what figure he took as the cubic capacity of coal in the retort, in order to ascertain the extent of filling.

Mr. GROGONO replied that he had taken 46 c.ft. per ton. The known figure of 42 c.ft. applied to coal which had been dropped from a viaduct, and was compressed. Filling a charge into the retort, did not compress it. The machine the President spoke of he had seen at Beckton.

Mr. W. T. KENSHOLE (Lea Bridge) said he had known considerable trouble to occur through there being only one motor on a machine. He believed in one type of Fiddes-Aldridge machine there were to be two motors. Reference had been made to the fitting of a stop-plate, which idea had not very long been brought out. This certainly performed the intended function quite well; but it had the disadvantage of increasing the wearing parts.

Mr. GROGONO said the stop-plate certainly did increase the wearing parts; but this portion of the machine did not give any trouble. He had seen a Fiddes-Aldridge machine with a motor on the side for travelling only; and it was very successful. He thought they would come to separate motors for every movement; and this would save a lot of time in a big house.

Mr. C. WRIGHT (Gas Light and Coke Company) asked what percentage of coal in the retort gave the best working results.

Mr. GROGONO replied that, unless the furnaces were sufficient to give a very big heat, it was no use filling the retorts.

Mr. J. HEWETT (South Metropolitan Gas Company) said he had been told by Mr. Stewart [who had then left] that the machine at Fulham had recently been fitted with a second motor; and this had reduced the charging time from 60 to 50 seconds. One type of machine that had always appealed to him (Mr. Hewett) was the De Brouwer, though he did not like the cloud of dust.

Mr. GROGONO said the De Brouwer machine was a very excellent one, and would lay a charge of any size. It had one objection, and that was that for some reason with a projector machine one got bad scurfing. A certain amount of dirt could be put up with, if it was going to give one a full retort or any size of charge required.

Mr. E. E. CALVERT (Gas Light and Coke Company) urged that, if there was a separate motor for driving, it would be advisable to have a brake. In getting a full charge with a Fiddes-Aldridge machine, when the bunker on the top of the machine was not large enough to take this extra amount, they had tried filling-up the telescopic shoot as well as the bunker; and it was found that in this way they could get a bigger charge.

Mr. GROGONO agreed that the question of a brake was very important. As to filling the telescopic shoot, they used to do this ten years ago at Beckton.

Mr. R. C MACDONALD (Chief Mechanical Engineer to the South Metropolitan Gas Company) said Mr. Grogono had given them a most interesting paper. As some of those present knew, he (the speaker) was for many years connected with the designing of the Arrol-Foulis machine; and a very long time ago, he thought it was absolutely doomed, comparing it with the West machine, which was its greatest opponent at one time. The West machine always had a bit of an advantage in laying a level charge. There was no getting away from this; but with the arrival of the pushers, the case was altered, and the Arrol-Foulis came into its own again. If he had been an outsider, he thought he would have said that the two machines that filled the bill best would be the Arrol-Foulis and the Drake, which had struck him always as being a very efficient machine. In connection with the filling of retorts, they were faced with the question of the capital cost of the retort-house. If they could fill the retorts and get as big a throughput as possible, it would save the carrying out of new work, which to-day was a very serious thing for everybody. Therefore the machine which could give the fullest charge would certainly be the most successful one, apart altogether from the cost of upkeep and the cost of working.

Mr. GROGONO said he had never yet known a Fiddes-Aldridge machine to jamb in a retort. Also they did not give any anxiety from breakdowns. There were many of these machines at Beckton; and it was very seldom they gave trouble.

Overcoming a Meter-Reading Difficulty.

There having been found so many occasions on which, owing to the absence of the occupiers, meter-readers were unable to get into houses or offices to read the meter, a simple expedient has been resorted to in Cincinnati, which is affording a great deal of relief to the officials of the Union Gas and Electric Company. In fact, Mr. Felix J. Koch, describing the system in the "American Gas Engineering Journal," declares that it is proving one of the most profitable innovations that has been introduced by the Company for many years. If the meter-man calls at a house or office, and receives no response to his knock or ring, he slips beneath the door a postcard having the address of the Gas Company's reading department printed across the face; so that all the recipient has to do is to fill in the blanks on the back, and put the card in the post. On the back of the card are five meter-dials, with the following intimation: "Owing to your absence, we were unable to read your gas-meter. Will you co-operate with us to the extent of making the reading, and mailing this card at your convenience? Mark as many of the circles below as the meter has dials, beginning with the dial on the right side, and marking from the centre to the edge of the circle, just as the dial-hands appear on the meter." Below the row of printed dials, there are spaces for the householder's name and address. These spaces are filled-in by the meter-reader who leaves the card.

SCOTTISH JUNIOR GAS ASSOCIATION

(WESTERN DISTRICT).

Visit to the Greenock Corporation Gas-Works.

A party of over a hundred members of the Association last Saturday afternoon visited the Greenock Corporation Gas-Works, where they were welcomed by Mr. George Keillor (the Engineer and Manager), who expressed great pleasure at seeing such a large and representative turn-out of both seniors and juniors. He wished to introduce Bailie Paterson (the Convener of the Gas Department) and Bailie Brown (the Convener of the Electrical Department), both being good friends of the gas industry. To add interest to the visit, it had been arranged that a descriptive and statistical pamphlet of works and working results would be presented to each member. Much information on both subjects was given by Mr. James Jamieson in his Presidential Address to the Association last October [see "JOURNAL," pp. 334-7].

The party were conducted round the works by Mr. Keillor and his assistants; and after the inspection, they were taken by special cars to the show-room in the centre of the town. Here tea was served.

Mr. J. CUBIE (Vice-President), on behalf of the Association, thanked the Greenock Corporation for the privilege extended to the members of visiting such a progressive and modern undertaking. Great credit was due to the Gas Department for the manner in which they had tackled the question of industrial gas. Mr. Jamieson (the President) mentioned the matter in his address, and also spoke (to use a vulgarism) of how they had "chanced their hand," against strong opposition, and put down the first large gas-heated core-drying oven in Great Britain, drawings of which were exhibited for the benefit of the members. He would ask the members to accord to Bailies Paterson and Brown, Councillor Whiteside, Mr. George Keillor, Mr. Jamieson, and the other assistants hearty thanks for the thorough manner in which the visit had been arranged and carried through.

Bailie PATERSON, who replied on behalf of the Corporation, said it was a great pleasure for him to be present. The junior of to-day was to be the senior of to-morrow; and it would not be in the best interest of the industry if corporations and companies did not extend to associations such as that a very hearty welcome. Probably most of those present were now in subordinate positions, but one day would be called upon to manage undertakings; and his best advice to the junior was to be tactful and enthusiastic. It had always been the policy of the Gas Committee to keep the concern up to date; and had it not been for the war, the works at Inchgreen would probably have been even more modern than they were to-day. He could assure the members that the Corporation were delighted to have been of some service to them.

The Edinburgh Gas Engineership.

A correspondent writes: The question of the appointment of the new gas engineer and manager for Edinburgh is causing some amount of interest beyond those immediately concerned. The Corporation Gas Sub-Committee on Thursday last reduced the candidates from twenty-one to five—viz., Mr. J. W. Napier, of Alloa; Mr. Geo. Braidwood, of Coatbridge; Mr. H. H. Gracie, the present Assistant Engineer and Manager; Mr. George Keillor, of Greenock; and Mr. W. Wilson, of Burton-on-Trent. One of the applications came from Christiania. In an editorial note in one of the local papers it is stated that applications were received from towns which enjoy gas rates much lower than that of Edinburgh; and the writer goes on to say that one young and energetic manager runs a private concern which provides the fortunate citizens with gas at 2s. 10d. per 1000 c.ft., and in addition pays a dividend of 9 p.ct. As Edinburgh citizens are paying 5s. 4d.—partly owing to heavy capital expenditure—the candidates might be interviewed and asked how it is done. Another point, about which there is considerable agreement (the paper observes) is that the consultative system which prevails in Edinburgh should be abolished. There is no doubt that, before the appointment is made, there will be a lively discussion in the Town Council, as it is one of those subjects which every member considers himself competent to speak upon. General surprise has been expressed that so few candidates put in for the appointment.

Midland Association of Gas Engineers and Managers.—At the annual general meeting of the Association, to be held at the Grand Hotel, Birmingham, on Thursday, March 3, at 2.30 p.m. (under the chairmanship of the President, Mr. J. R. Duff, of Banbury), the forty-third report of the Committee will be presented. The Committee will recommend the election of certain members as honorary members. The new President, Mr. Jas. Paterson, M.A., of Cheltenham, will deliver his address; and Mr. R. G. Marsh, Fittings Engineer to the Birmingham Gas Department, has promised to open a discussion on "Fitters' Timekeeping."

"Transactions" of the Institution of Gas Engineers.—Acknowledgment has to be made of the receipt of a copy of the "Transactions" for 1919-20 of the Institution of Gas Engineers, edited by the Secretary, Mr. Walter T. Dunn, F.C.I.S. It is a big volume, and has as a frontispiece a portrait of the President, Sir Dugald Clerk, K.B.E., D.Sc., F.R.S. The reports and papers submitted at the annual meeting (with their numerous plates) occupy a lot of space; and in addition there is an account of the visit in October, 1919, to the Marne and Somme battlefields. There are also a lengthy list of memoirs, and a number of useful abstracts, by Mr. A. V. Hendrickson, of papers published in various chemical journals.

SIXTY YEARS AGO.

[From the "Journal" for February, 1861.]

Tests of Sulphur in Gas.—As the presence of sulphur is again brought forward as an objection to the use of gas in private dwellings, it may be desirable to recapitulate briefly the evidence previously adduced to prove that the minute quantity of sulphur that remains in purified gas is not converted, during combustion, into any injurious product. The experiments of Dr. Leeson and of Mr. Warington, confirmed by those of Mr. Lewis Thompson, established the following facts: That free sulphuric acid cannot be retained in a vaporous condition in the atmosphere at a lower temperature than 600° Fahr.; that sulphurous acid does not become oil of vitriol by absorption of oxygen from the atmosphere, and not even by exposure to pure oxygen gas; that the proportion of sulphur in gas as supplied by the Metropolitan Companies is infinitesimally small; that any sulphur contained in coal gas combines immediately during combustion with the ammonia that is always present in it, to form sulphate of ammonia, which is perfectly innocuous; and that the analyses of the vaporous products of the ordinary combustion of gas show the total absence of free sulphurous or sulphuric acid. More conclusive evidence of the absence of sulphur acids in the products of combustion could scarcely be conceived; but, as if to make assurance doubly sure, Mr. Lewis Thompson condensed the vapour of a room highly heated with gas, until he had collected as much as 40 gallons of water, which he subjected to analysis. In the whole of this quantity, not a trace of free sulphurous or sulphuric acid was perceptible. The sulphate and the formiate of ammonia were present; but no trace whatever of free sulphuric acid. Even when the unpurified gas, as it issued from the retorts, and before it had passed through the condensers, was burned, the products were alike destitute of sulphur acids.

Gasholder Development.—In order to meet the enormous development which the consumption of gas is now experiencing, gas companies, even in our second and third rate provincial towns, have to provide apparatus and vessels of dimensions which a few years since it would have been deemed hazardous to attempt to construct. Thus, the Gas Company of Cheltenham—a town which, in 1851, contained only 35,000 inhabitants—is now about to construct a gasholder tank, 140 ft. in diameter by 25 ft. deep, under the able direction of Mr. Esson, the Company's Engineer; while the Metropolitan Imperial Gas Company have commenced the construction of three tanks, arranged within a triangle, and connected with each other, of the respective diameters of 145 ft., 134 ft., and 105 ft., all being 55 ft. deep, upon land purchased at Agar Town, in the vicinity of their St. Pancras station. The foundation-stone of this remarkable work was laid by the Deputy-Governor of the Company, Mr. Vaughan Richards. The designs of the tanks have been made by Mr. Methven, the Engineer of the St. Pancras station; and the contract has been taken by Messrs. John Aird and Son, the eminent contractors, of Belvedere Road, Lambeth. The cost of the three tanks alone, when completed, will be about £30,000. The gasholders are to be single lifts, and will contain 2 million c.ft.

A NEW GAS-TURBINE.

Tests have, says the "Engineer," now been resumed at the works of Messrs. Thyssen and Co. with the gas-turbine invented by H. Holzwarth. This turbine, one built in 1914, is of the vertical type; but it has already been ascertained that certain improvements will result with a horizontal type—among them the better accessibility of the engine parts.

The tests have been directed to the obtaining of a more economical pressure of the exploding gas; and it is reported that they have been largely successful, in so far as an effective pressure of 170 to 200 lbs. per sq. in. is now obtained, against 70 to 85 lbs. formerly. A further important improvement has been effected by shortening the time of expansion, which is now one-tenth of a second, against one-third of a second in the case of large gas-engines making 90 revolutions per minute.

Great pains have been exercised on the discovery of the best form of turbine blade, and on the search for the right material. The ordinary steam-turbine blade could not be adopted, as gas-turbine blades have to withstand heavier forces than those of steam-turbines. The blades are fixed in the drum, in much the same way as in steam-turbine practice; but it has been found that the shroud-ring usually placed round steam-turbine blades tends to become loose if fitted to gas-turbine blades, on account of the difficulty of securely fastening it to the blades, constituting a continual danger when the machine is running. The top, base, and body of the blade are therefore now made of a solid piece of metal (like De Laval turbine blades), with satisfactory results.

As regards the material of which the blades were to be made, exhaustive experiments were carried on with all sorts of steel and steel alloys of every degree of toughness; and soft electro-iron was ultimately fixed upon as being the most suitable material. Changes of grain were observed on blades made of any other hard or soft steel after short use, and there was also a decided tendency to split and peel; but blades made of electro-iron stood well up to extensive tests, and compared favourably with those of steam-turbines of an equal length of service. It is therefore expected that gas-turbine blades will last as long as do those of steam-turbines—always, of course, providing that the gas used does not contain an excessive admixture of water or steam, to cause early corrosion.

CLEANING BLAST-FURNACE GAS.

Some important points regarding rough gas cleaning at the Skinningrove Iron-Works were presented in a paper by Messrs. E. BURY, A. BURY, J. OLLANDER, and T. BAINBRIDGE, read by the last-named before the members of the Cleveland Institute of Engineers at Middlesbrough, on Monday, the 7th inst.

The electro precipitation plant was started on April 8 last. With 85 to 90 p.ct. of the plant at work, the dust in the gas, it was stated, had been reduced from 5 to 6 grammes per cubic metre in the dirty gas to 0·8 to 1·1 grammes in the cleaned gas—a result obtained with a total fuel consumption corresponding with 50 KW. only. No power was necessary for pumping water or for moving gas through the system. The cleaning had been effected by a comparatively small loss of the original sensible heat. The raw gas entered the cleaning chambers at 220° to 250° C.; the cleaned gas left at 200° to 220° C. The surplus gas available had increased; but the exact economy could only be determined when all stoves, &c., had been cleaned, and the clean gas given a fresh start. There was a recovery of 40 to 50 tons of dust per week, containing 20 to 27 p.ct. of potassium chloride.

DISCUSSION.

Dr. J. E. STEAD observed that credit was due to the Skinningrove Company for the encouragement they had given to their staff in bringing forward the process. He pointed out, however, that nothing had been estimated as to actual cost. Blast-furnace people were waiting for what was most suitable for their purpose. When some process was adopted for all the blast-furnaces in the neighbourhood, they might find the atmosphere purified, and white smoke done away with.

Mr. J. H. HARRISON remarked that the outstanding feature of the subject was the cleaning of the gas. The object was to get clean gas for their boilers and stoves. He did not think the Skinningrove Company had the idea of cleaning the gas so far as to make it directly usable in engines.

Mr. C. H. RIDSDALE said they had not only to consider the matter of pounds, shillings, and pence for the potash; there was also the point as to the longer life in the stoves.

Dr. BUSH stated that France, America, and Germany had nothing to show beyond what had been achieved in this country.

Mr. A. HUTCHINSON (of the Skinningrove Company) said it might help regarding the commercial possibilities of the process if a little history were told. The stimulus to some electric method of cleaning blast-furnace gas came from Dr. Stead. The actual work of which the paper given that night was the result had been started originally as a war measure, when the country was short of potash. First of all they were told that the process would cost about one-third of the Halberg-Beth system. It had now been proved beyond doubt that, given a method by which they got out dust from the blast-furnace gas, it was possible to obtain a potash salt of great purity which was much more valuable than the ordinary potash salts in the rough gas, and had a much higher worth than its mere manurial value. The process was now a success, so far as experiments at their plant showed; and he believed it would be a paying proposition.

Steaming Woodall-Duckham Verticals at Meriden, U.S.A.

The coal-gas plant of the Meriden (Conn.) Gas Light Company consists of three Woodall-Duckham benches, each containing four retorts, of a nominal capacity of 5½ net tons of coal per retort per day. A recent reduction in the B.Th.U. requirements by the State to 528 has made it possible to steam. The amount of steam introduced has varied up to 10 p.ct. of the weight of coal carbonized, depending upon the state of the holders and the quality of the coal. This has resulted in an average yield during the last few months (even with the poor mixed coal that has been available) of 5·56 c.ft. per pound of coal, with an average value of 528 B.Th.U. An unexpected feature is that the throughput per retort has increased from about 5½ net tons to 7 net tons of coal per retort per day. It is suggested that the reason for this greater throughput may be that the increased circulation of gas through the lower part of the retort, due to the introduction of steam, has caused a better heat transmission into the centre of the charge; or it may be possible that improved producer operation, owing to the use of sized coke, accounts, at least in part, for the increased throughput. Operating conditions, consequent upon the variable quality of the coal, &c., have so far not been stable enough to enable accurate comparative tests to be made. During the last few months it has been possible to obtain an occasional wagon of gas coal of good quality; and this has been mixed with coal from store, and used. Over these periods, the plant, which had a nominal capacity of 750,000 c.ft. of gas a day when not steaming, has produced slightly over 1,000,000 c.ft. of about 528 B.Th.U. gas per day, with a yield of over 6 c.ft. per pound, using 10 p.ct. of steam. When the time comes for a normal supply of good coal, there is felt to be no reason for doubting that even these good results can be very substantially improved. Eleven men receive all coal from the railway, operate the retort-house, handle all coke, and deliver it to wagons.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Sutton Amalgamation.

SIR,—The observation I have to make on Mr. H. E. Jones's outburst on the corrections in my letter in your issue of the 9th inst., is that these corrections are obvious, and readily apparent to anyone capable of disinterested judgment. In his attempt to gain possession of the Sutton undertaking, Mr. Jones has suffered a severe reverse, and naturally does not like it; but this, I submit, is not a justification for his attempt to traduce a compeer.

A word on the two salient facts which Mr. Jones says were suppressed: "(1) For the last two years the Sutton repairs have not been made, but deferred; and (2) that the gas as made on Mr. Carpenter's system of water gas—enforced, he said, by insufficient purifiers—lowered the quality 12½ p.ct. below the Wandsworth quality."

(1) The following comparative figures of expenditure on repairs at Sutton and Wandsworth, for a period of five years, show that the Sutton repairs have not been deferred, but that sufficient sums have been annually spent for proper maintenance; and, in fact, the expenditure is not much less than that at Wandsworth.

Repairs and Maintenance of Works and Plant, and also for Mains, Services, and Meters for Sutton and Wandsworth, from 1915 to 1919, per 1000 C.Ft. of Gas Sold.

	Sutton.		Wandsworth.	
	Works.	Meters, Mains, and Services.	Works.	Services, Meters, Mains.
1915	3·19	5·30	4·45	4·78
1916	4·38	3·20	4·48	3·85
1917	3·97	2·63	4·62	3·05
1918	6·11	3·39	7·35	4·03
1919	9·30	1·52	10·37	5·36
	5)26·95	5)16·04	5)31·27	5)21.07
Five years average	5·39	3·21	6·25	4·21
Totals for works, mains, services, and meters		8·60		10·46

To the foregoing figures, there is the additional evidence of the excellent condition of the whole of the manufacturing plant at the present time.

(2) *Quality of Gas and Capacity of Purifiers.*—Mr. Jones gives no figures; so I can only deal with these points from my own observations. First, with regard to quality, the diagram of a recording calorimeter—the property, I believe, of Mr. Jones—showed the calorific value of the gas to average 450 B.Th.U. over a period of days. I have no knowledge of the quality of the Wandsworth gas, and do not wish to suggest that that Company are supplying a quality of 560 B.Th.U. So perhaps Mr. Jones will explain where the 12½ p.ct. difference comes in. From what I saw, I am of opinion that the quality of the Sutton gas will compare favourably with the bulk of the gas supplied in the Metropolitan area.

On the question of purifiers, Mr. Jones's contention of insufficiency is not supported by the figures of actual working. The total number of purifiers changed in 1920 was thirteen. Practically a purifier per month! A comfortable position compared with many works at the present time. Moreover, I submit that, having regard to the low cost of the Sutton purification—well under 1d. per 1000 c.ft.—it would not be a commercial proposition to embark on new or additional purifiers at present-day costs. The plant is in very good condition, and of sufficient capacity to deal with the present rate of increased production for a few years, if required.

The defects in the mains, also referred to by Mr. Jones, can, in the matter of capacity, be easily overcome, at comparatively small outlay, by boosting.

As regards the condition of the distribution plant, the figures of leakage being fairly comparable with those of Wandsworth is surely the highest possible testimony to the excellent condition of the mains, service-pipes, and meters.

From the tone of Mr. Jones's last letter, it may be assumed that he has no intention of dropping this discussion before having bared, to the light of day, every defect, real or imaginary, of this undertaking. In this event, I would venture to suggest that a few comments on the gasholders would be of interest. Two of these, it will be remembered, were declared by Mr. Doig Gibb—the engineer for the amalgamation to be absolutely in a state of ruin, which I, on the contrary, reported to be in a thoroughly sound condition, and good for many years of useful service.

Widnes, Feb. 21, 1921. ISAAC CARR.

The Application of Reinforced Concrete to General Gas-Works Practice.

SIR,—The paper read by Mr. L. H. Thomas, Assoc.M.Inst.Mech.E., before the Midland Junior Gas Association, and published in your Jan. 26 issue, I found very interesting; and it will no doubt influence many engineers to use concrete for the purpose of reducing maintenance charges on gas-works buildings—a costly item in these times.

I wish to emphasize Mr. Thomas's statement that concrete work should be put into the hands of contractors who are specialists in this work, or, I would add, put the supervision of the work and design in charge of a concrete engineer. The concrete work done by an ordinary contractor and builder may be an honest effort to do good work, as far as he understands concrete; but he cannot hope to have the expert technical knowledge to carry out first-class work.

I note Mr. Thomas mentions that a 1—2—4 plain concrete, if made dense enough, is water or oil proof. I fear he is referring to highly specialized work, on which a vast amount of time and labour has been expended, not only in laboratory tests for the absolutely correct proportions of the aggregate to be used, but also in field work to secure these requirements being carried out.

Mr. Thomas also mentions the use of clay to make certain that all voids are filled up. This would be utilized if the difficulties and cost of perfectly grading aggregates for practical work on a large scale were not so very expensive. As a matter of fact, clay is now superseded by patented void fillers, that not only fill the voids, but, by chemical reactions that are strictly logical, form calcium silicates in the concrete, thus increasing the compressive strength 50 p.ct. or more over plain concrete. I am, of course, not thinking of the lime soap nostrums greatly advertised for waterproofing cement renderings.

Mr. Thomas dwells upon the cost of shuttering for concrete; but this cost is gradually eliminated by experience. Concrete walling machines are now coming into use, that can be moved continuously along the concrete wall, and allow a cube yard of concrete to be filled at each position. For reinforced work, a powerful timber form is raised with proper appliances, and concrete filled in 2 ft. or 3 ft. high at each lift, the full length of the wall. This does away with the risks of seepage through day-work joints as mentioned in his reply, and a great saving in shuttering costs.

The best class of concrete work, with the voids carefully eliminated by the use of a scientifically prepared filler, is cheaper than metal or brickwork, both in first cost and upkeep—the latter requiring no provision except for injury by fire or accident. This is true, too, of properly constructed concrete roads that are laid over a well pitched base of hard core.

It would be an advantage to your readers if detailed reports of concrete work done for gas installations were frequently illustrated in the "JOURNAL," to encourage other gas engineers to use concrete and be rid of the upsetting problems of repairs that now worry them.

H. CRAIGHILL BADDER, Works Manager,
Torbay and Dart Paint Company, Ltd.

Victoria Road, Willesden, N.W.,
Feb. 17, 1921.

The Carbon Monoxide Inquiry—A Correction.

SIR,—I shall be obliged if you will kindly insert a correction of your report of my evidence on the carbon monoxide inquiry, in which I am made to say that "the danger from carbon monoxide was its resolution into carbon dioxide." As a matter of fact, the only danger from carbon monoxide is when it escapes into the atmosphere of a room and is inhaled in its original state. On combustion, it is resolved into carbon dioxide; its only effect being slightly to add to the contamination of the atmosphere necessarily arising from the respiration of persons present, or the production of illumination by means of a flame, whether of gas, candles, or oil lamps.

T. GOULDEN,
Gas Light and Coke Company.

Horseferry Road, Westminster, Feb. 17, 1921.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Feb. 16.]

Nos. 4308 to 5021.

AGOPIAN, A.—"Apparatus for measuring fixed quantities of liquid." No. 4729.

CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE COMPANY, LTD.—"Distillation of tar." No. 4902.

GREW, F. W.—"Means for adjusting air supply of incandescent gas, &c., burners." No. 4481.

HILL, H.—"Incandescent gas-mantles, &c." No. 4775.

HURST, P.—"Equilibrium gas-governors." No. 4768.

LITTLE, W. P.—"Gas-meters." No. 4646.

LUSH, E. J.—"Treatment of producer gas, &c." No. 4980.

MACLAURIN, R.—"Producer for dealing with low-grade fuels." No. 4337.

NOTT, W. F.—"Incandescent gas-mantles." No. 4581.

PALMER, J. F.—"Gas and air compressors or blowers." No. 4526.

PARKINSON AND W. & B. COWAN, LTD.—"Equilibrium gas-governors." No. 4768.

RICHARDSON, R.—See Nott. No. 4581.

ROBERTS, A.—"Recovering bye-products from distillate gas." No. 4996.

SHAND, A. M. & W. L.—"Gas-burners for heating, cooking, &c." No. 4725.

SIMPSON, J. F.—"Apparatus for gasification of carbonaceous fuel." No. 4490.

WILTON, N. & T. O.—See Chemical Engineering and Wilton Patent Furnace Company. No. 4902.

Bishop's Stortford, &c., Gas and Electricity Company.—At to-day's meeting, the Directors will report that the sales of gas for the half year ended Dec. 31, as compared with those for the corresponding period of the previous year, show an increase of 1·74 p.ct., and the revenue from residuals a gain of £2345. On the other hand, the cost of manufacture, repairs and maintenance, &c., was £5053 more. The balance available for distribution is £3175; and there will be a balance of £573 to carry forward, after payment of the preference dividends, and dividends at the rate per annum of 3¾ p.ct. on the "A" and "B" ordinary stocks—these being the maximum rates authorized by the Temporary Increase of Charges Order. To meet the additional costs, the price of gas was advanced 1s. 3d. per 1000 c.ft. as from the beginning of the half year. The Company have applied to the Board of Trade, under the Gas Regulation Act, for a standard price per therm.

PARLIAMENTARY INTELLIGENCE.

On Tuesday of last week, His Majesty the King opened the third session of the thirty-first Parliament of the United Kingdom.

Petitions against Bills.

Petitions have been presented against the following Bills: Rhymney and Aber Valleys Gas and Water Bill, by the Great Western Railway Company and the London and North-Western Railway Company, Caerphilly and other Urban District Councils in the Rhymney Valley, Rhymney Railway Company, and the Gelligaer Urban District Council; the Tendring Hundred Water and Gas Bill, by the Frinton-on-Sea Urban District Council, the Harwich Corporation, and the Tendring Rural District Council, Walton-on-the-Naze Urban District Council, Great Eastern Railway Company, Essex County Council, Lexden and Winstree Rural District Council; the Waltham and Cheshunt Gas Bill, by the Hertfordshire County Council and the Cheshunt Urban District Council; the Radcliffe and District Joint Gas Board Bill, by the Manchester Corporation, the Heywood Corporation, and the Lancashire and Yorkshire Railway Company; the Harrogate Gas Bill, by the Harrogate Corporation and the North-Eastern Railway Company; the Cardiff Gas Bill, by the Great Western Railway Company, the Penarth Urban District Council, the Cardiff Corporation, and the Llandaff and Dinas Powis Rural District Council; the Swansea Gas Bill, by the Great Western Railway Company, the London and North-Western Railway Company, the Rhondda and Swansea Bay Railway Company, the Midland Railway Company, and the Swansea Corporation; South Metropolitan Gas Bill, by the Bermondsey, Camberwell. and other Borough Councils; Manchester Corporation (General Powers), by the London and North-Western Railway Company, Cheshire Lines Committee, Manchester Committee of Road Users, Lancashire and Yorkshire Railway Company, Great Central Railway Company, Altrincham Gas Company, Trustees of the will of Sir Humphrey de Trafford, Great Northern Railway Company; Wandsworth, Wimbledon, and Epsom District Gas Bill, by the Epsom Urban District Council, and the Wandsworth Corporation; Nelson Corporation Bill, Lancashire and Yorkshire Railway Company, Lancashire County Council, Owners of Mills, &c., in Catlow Brook or Walverden Water.

The Winchester Water and Gas Company have petitioned to be heard against the Southampton Corporation Water Bill; the Durham County Transport Bill, by the Newcastle-upon-Tyne and Gateshead Gas Company and the South Shields Gas Company; the Lea Conservancy Bill, by the Commercial Gas Company; the Metropolitan Water Board Bill, by the South Metropolitan Gas Company; the Middlesex County Council Bill, by the Brentford Gas Company; the Taf Fechan Valley Water Board Bill and Taf Fechan Water Supply Bill, by the Rhymney and Aber Valleys Gas and Water Company.

Bills to Originate in the House of Lords.

The following Bills will originate in the House of Lords: Hoylake and West Kirby Urban District Council Bill; Manchester Corporation (General Powers) Bill; Nelson Corporation Bill; Rhymney and Aber Valleys Gas and Water Bill; South Metropolitan Gas Bill; Tendring Hundred Water and Gas Bill; Waltham and Cheshunt Gas Bill; Wandsworth, Wimbledon, and Epsom District Gas Bill.

Bills Read the First Time.

In the House of Lords, the following Bills were read the first time: Nelson Corporation, Manchester Corporation (General Powers).

The following were read the first time, and referred to the Examiners: Rhymney and Aber Valleys Gas and Water Bill, South Metropolitan Gas Bill, Tendring Hundred Water and Gas Bill, Waltham and Cheshunt Gas Bill, Wandsworth, Wimbledon, and Epsom District Gas Bill.

In the House of Commons, the following Bills have been read the first time: Batley Corporation Bill, Burnley Corporation Bill, Cardiff Gas Bill, Colne Corporation Bill, Harrogate Gas Bill, Leicester Corporation Bill, Radcliffe and District Joint Gas Board Bill, St. Helens Corporation Bill, Swansea Gas Bill, Wigan Corporation Bill.

Motor Fuel Supplies.

Sir J. D. REES asked the Prime Minister what action the Government proposed to take on the second report on motor fuel of the Sub-Committee of the Standing Committee on the Investigation of Prices.

Mr. BRIDGEMAN, who replied, said the policy of the Government had been to encourage the development of additional sources of supply of motor fuel and, through the Fuel Research Board, to assist research with a view to the production of substitutes on a commercial scale. The Committee in their second report laid stress upon the importance of action in both these directions. In view of the country's serious dependence at the present time on foreign sources of supply, it would not be practicable to attempt to control prices and distribution.

Big Increase in Output at Scarborough.—The report adopted at the annual meeting of the Scarborough Gas Company recommended payment of the usual dividend at the rate of 5 p.ct. per annum on the ordinary stock for the past year. This will leave a balance on the profit and loss account of £1554 to carry forward. The sum of £5524 has been placed to the credit of reserve account. The whole of the amount withdrawn during the war has now been replaced; and the account stands at the maximum permitted. The sale of gas for the year showed the large increase of 54 million c.ft. (14 p.ct.) over the previous twelve months. During the year £5000 of 6 p.ct. mortgages, for a period of seven years, was issued for the purpose of paying-off a similar amount of 3½ p.ct. loans which matured on Dec. 31, 1919. The Scarborough Gas Company (Capital Issues) Consent, 1920, having been received from the Board of Trade, the Directors have decided, in accordance with the resolution passed at an extraordinary meeting of shareholders last September, to offer for sale by tender £44,250 of 7 p.ct. mortgages, to be repayable on Dec. 31, 1930.

MISCELLANEOUS NEWS.

LIMITATION OF INERTS.

BOARD OF TRADE COMMITTEE SITTINGS.

First Day.

The Committee appointed by the Board of Trade under the Gas Regulation Act, 1920—section 2 (4)—to inquire whether it is necessary or desirable to prescribe any limitations on the proportions of incombustible constituents which may be supplied in gas, held their first sitting on Wednesday of last week, Feb. 16. The Committee consists of Mr. J. Hunter Gray, K.C. (Chairman), Mr. W. J. Atkinson Butterfield, M.A., and Dr. C. H. Lander. Evidence was given on behalf of the Sheffield Gas Consumers Association, who were represented by Mr. D. Flather (Messrs. W. T. Flather, Ltd.), Dr. R. S. Hutton (Sheffield Flat-Ware Company), Mr. E. G. Wells (Messrs. Edgar Allan, Sons, & Co.), Mr. R. J. Sarjant (Messrs. Hadfields, Ltd.), and Mr. J. Imrie (Messrs. Vickers, Ltd.). These gentlemen were not examined individually, but gave their views more or less simultaneously; so that the meeting really resolved itself into a round-table conference between the Committee and the five representatives of Sheffield. The inquiry gained rather than lost by this.

The CHAIRMAN, at the commencement, said the Committee had read through the documents which the Sheffield Gas Consumers Association had sent in; and it seemed to him that broadly, the conclusions which had been come to were: First, that a known amount of incombustibles should be in gas; and, secondly, that the effect of these incombustibles was prejudicially to affect the use of gas in the hands of the consumers. Therefore, there should be some limitation of the amount.

Mr. FLATHER said that was so.

The CHAIRMAN said that what struck him with regard to the matter was this. The Association had given results showing the quantity of inerts over a given time. [The Association had sent in continuous records for 1918 of the composition of the Sheffield gas supply. For three years, the total inerts amounted to a minimum of 10·4 p.ct.; the maximum was 51·8 p.ct.; and the average 27·8 p.ct.]. He did not find in the information sent in records of any experiments showing the extent to which this amount of incombustibles was detrimental. He would like the guidance of the Association on this point. With regard to the effect of incombustibles on furnace working, were there also any experiments or tests which would give information in regard to this; and if there were, could the Committee be told what type of furnace was used? He asked the question because he could conceive that the tests might have been made, if they were made at all, on an old-fashioned type of furnace, and one seldom used now, and consequently if gas with the same amount of incombustibles was used in a different furnace, it would give different results.

Mr. FLATHER said that with regard to the first question, the Association were agreed that it was desirable that there should be a maximum fixed for the percentage of inerts; and to a large extent their views were embodied in the report of the conference which the Fuel Research Board held some time ago, at which all sides were represented. The recommendation then made was that the amount should not exceed 12 p.ct. ultimately. This was the unanimous opinion at the time—with a higher permissible limit for the next few years. With regard to the second question, as to proof, the general experience in Sheffield was proof as to the manner in which gas with a high percentage of inerts was detrimental to the consumer; but the Association had all along desired that the Fuel Research Board, or some other independent body, should carry out a research on the matter, and so arrive at some exact knowledge. The experience in Sheffield, however, was that from the time when the local gas supply began to show an increase in inerts, consumers had had a steadily increasing difficulty in getting the results they required. In the heat treatment of steel, which was a most important industry in Sheffield, there were two essentials—first, the accuracy of temperature, and second, the length of time taken in heating. If the time taken in heating some of the special steels was excessive, a permanent (or at any rate temporary) injury might be done to the material, which would affect its commercial value. The furnaces in general use by the members of the Association were by no means obsolete or old-fashioned. They were prepared to agree that the perfect furnace had yet to be evolved; but most of the people in Sheffield were well-informed as to the means of adjustment which existed, and their experience so far had shown that there was no known method of utilizing with efficiency a gas with a high percentage of incombustibles, especially in view of the two factors he had mentioned—viz., time and temperature. In the very early days of the consideration of this and kindred questions, a strong recommendation was made to the Fuel Research Board, that the question of inerts should be inquired into. In fact, Sir George Beilby himself agreed that it was a very necessary thing, and it was to be hoped that in future a research would be put in hand which would answer the question very definitely. But so far as Sheffield's experience went, they certainly were prepared to maintain that the presence of, at any rate, more than a reasonable amount of inerts—the degree of reasonableness being based on the figures agreed upon at the Fuel Research Board conference—did not lead to economy or efficiency in steel-works practice.

The CHAIRMAN said he did not wish it to be understood that he suggested that the Sheffield furnaces were obsolete or old-fashioned. He was only speaking hypothetically in order to ascertain, if such tests were carried out, what type of furnace was used.

Dr. HUTTON took it that what was in the Chairman's mind was whether, if there was no limitation of inerts, such a gas could be used

with a more modern or complicated type of furnace. The only way they got through in Sheffield during the war was because of the margin that was possible. They had started with a very low proportion of inerts, but had gone up gradually to an absolutely unprecedented amount. The margin in the furnaces really saved the country; but the steel industry suffered grievous hardship, and had many weeks and months of very hard times, during which a lot of material was spoiled. Originally, before the war, the gas at Sheffield had a calorific value of 650 B.Th.U., and contained 5 p.ct. of inerts; but it had gradually got down to below 500 B.Th.U., and the average of inerts was between 25 and 30 p.ct. With such gas, the margin in the furnaces was very small; and it was felt very strongly indeed that it was practically hopeless for the steel industry to continue under these conditions, if it was to be left at the mercy of the Sheffield Gas Company. Under the Act, the Company had absolute power to declare any calorific value or to alter the calorific value; and if there was to be no control either upon this or upon the percentage of inerts, the Company could supply any gas they pleased, no matter how much it upset the industrial consumer. The members of the Association were fully conscious of the advisability of improving the methods of producing gas, and of encouraging experiments in this direction; but industrial users did not feel at all safe if gas companies were to be allowed freedom to carry-out such experiments as were persistently being made—for instance, at Nuneaton. This matter was one of the greatest importance in a place like Sheffield, where the industrial use of gas had gone up from about 6 p.ct. of the total make to over 20 p.ct. With regard to the types of furnace employed, he was quite prepared to admit that it was possible to replace many of the existing furnaces by furnaces that would work with a gas of less than 500 B.Th.U., and a higher percentage of inerts. A modern regenerative furnace would probably permit of even a producer gas being used; but it was particularly desired to call the attention of the Committee to the fact that the whole of the industrial gas load in Sheffield was on gas of a relatively high calorific value and a relatively low percentage of inerts. This gas had been distributed not only to the large works but to hundreds and thousands of small users, whose furnaces were in the hands of ordinary workmen. The capital cost of changing-over all these furnaces to regenerative furnaces would be absolutely prohibitive; and from the discussions which the Association had had, he understood that the larger works would be driven to instal their own gas-plant rather than do this. The poor quality of the gas now being supplied was responsible for the reduced call on the gas-works for gas, quite apart from the reduced call due to the reduction in the amount of munition work. A great deal of the trouble was due to the low calorific value and chemical composition, and also to the specific gravity, which was not only much higher than it used to be, but fluctuated very considerably from time to time.

The CHAIRMAN said the Committee wanted, if it were possible, to be actually convinced as to the effect of inerts in reducing the value of gas, and not merely to have statements based upon experience, although they were valuable to have. He would like figures of tests showing the actual difference in the gas when the proportion of inerts was small and when it was large; also when the calorific value was 650 B.Th.U., and 480 B.Th.U., when using a proper burner and under proper pressure. He could quite understand that putting in inerts might be harmful. But it did not seem to him that it would necessarily be so; and the Committee would like some tests which would satisfy them that the inerts made an appreciable or substantial lowering of the value of the gas when used in a proper burner and at a proper pressure.

Mr. FLATHER replied that when the gas only contained 5 p.ct. of inerts, the consumers were so satisfied that they did not trouble to make tests of it; and the Association could not, therefore, help the Committee materially in this direction. He wished particularly to emphasize the request that comparative tests should now be made upon gas of varying composition.

Mr. IMRIE was afraid there were no existing tests as to the effect of inerts in gas. Tests had been carried out by the Gas Investigation Committee of the Institution of Gas Engineers as to the effect of inerts in connection with incandescent mantles and kettles, and also for gas-fires. These were very valuable tests; and the general result was that inerts were not harmful in these cases. So far as furnaces were concerned, it was only possible to go by bitter experience, which was that they did not now get the work out of their foundries that they used to. The pressure was higher than it used to be; and it went up to as much as 35-10ths. But it was only with great difficulty that the furnaces could be made to do the same work that they did before the war with gas of 530 B.Th.U., and a pressure of 20-10ths or 23-10ths. Therefore the only conclusion they could come to was that the trouble was due to the larger proportion of inerts. As there were no tests on furnaces, however, he supported the suggestion that they should be made either by the Fuel Research Board or by the Gas Investigation Committee, or by some body which could command supplies of gas of varying quality. He did not think any consumer was likely to embark upon such tests, owing to the heavy expense which they would involve. The Association also contended that, when Sir George Beilby issued his report upon gas standards, he had no idea in his mind that producer gas would be supplied by ordinary gas undertakings. But it was practically producer gas which was being sent through the mains to-day. In fact, they were getting more carbon dioxide in the town gas than there was in producer gas. The company with which he was concerned used over 1000 million c.ft. of gas last year; and the total bill was £14,500. The average inerts in the gas was 26·3 p.ct.; and this represented a sum of £3811 for absolutely valueless material. He did not suggest that they should have gas entirely free from inerts, but 1 p.ct. of inerts represented £150 to his company for their Sheffield works alone, which used only one-tenth of the total gas used by his company and its associated firms.

The CHAIRMAN: You appreciate that in future you will be charged according to the heat units?

Mr. IMRIE said he did. Continuing, he remarked that practically all the gas used in his Sheffield works was for furnace purposes, in which they were endeavouring to obtain a temperature of 900° C., on an average. The inerts which were in the gas were 10 p.ct. of air, 13·3 p.ct. of nitrogen, and 3 p.ct. of carbon dioxide. He did not claim that he had to heat-up the air; but, disregarding this, every 1 p.ct. of the nitrogen and carbon dioxide mixture entailed an annual expenditure of £11 in being heated to furnace temperature. And seeing that 50 p.ct. of the total gas being used in Sheffield was for industrial purposes, this worked out to a sum of £7000 or £8000 per annum for heating-up every 1 p.ct. of inerts to furnace temperature, on an average of 20 to 25 p.ct. of inerts. Such a sum of money would be better spent in the gas-works in decreasing the inerts and in supervision in keeping them to a moderate percentage.

Dr. LANDER asked what type of furnace was being used. He presumed it was not a regenerative furnace.

Mr. IMRIE said it was not. If it was, they could use producer gas.

The CHAIRMAN said that supposing they assumed a gas in which the only inert was air, or the nitrogen from it, if the gas undertaking supplied some air to the gas before it came to the burner, it would require less to be supplied in the furnace for complete combustion. This, he took it, would not be regarded as a detrimental thing.

Mr. SARJANT, replying on this point, said it was a difficult matter, under works' conditions, to get exact scientific information. He submitted, therefore, that *a priori* evidence must be admitted. If they had accurate information of the specific heats, and accurate knowledge of the behaviour of the gases, then it must be admitted that theoretical calculations should give a reliable indication of what was going to happen, even if thousands of pounds had not been spent on tests. He spoke on behalf of one of the largest consumers in Sheffield, who used a million cubic feet per day during the war. During that time the density varied between ·46 and ·66 relative to air (and that was rather a wide variation of density), corresponding to 16·5 p.ct. and 41 p.ct. of inerts respectively. With such varying density, it was impossible to get perfect operation of the furnace, and the efficiency suffered very badly. The consumer had no guarantee that gas of a fluctuating density would not be supplied, if there was no restriction on the permissible inerts. In support of the figures given by Mr. Imrie, showing the amount of money involved in heating the inert constituents to the temperature of the furnace chamber, he had prepared, from the best-known accurate figures of the specific heats, the percentage of gas of an average of 500 B.Th.U. which would be required additionally to heat 10 p.ct. of avoidable inerts to a furnace temperature of 600° and 1000° C. respectively. The figures came out to 0·47 p.ct. and 0·67 p.ct. for the two temperatures for nitrogen and (say) diatomic gases generally, and 0·59 p.ct. and 1·07 p.ct. respectively for carbon dioxide. These figures were really inside the limits of observation under ordinary works' conditions; and to get full information would require much more scientific experiments than it was possible to carry out under works' conditions. Another aspect which he wished to bring to the notice of the Committee was that if it was to be the policy of gas companies to supply only a gas with high inerts, it could only be corrected-for by installing regenerative furnaces; and there were conditions under which it did not pay to put in these furnaces. There were certain classes of work—intermittent work, for instance—in which it was an open question whether the heat recovery of the regenerative furnace actually compensated for the additional heat required to get the furnace up to the working temperature. In these cases, it was a matter of high flame temperature, high calorific intensity of the gas, which was required—the products leaving the furnace at as low a heat as possible. As to putting air into the gas at the gas-works, as mentioned by the Chairman, if the air was going to vary in the primary mixture, then it would upset the injection of the secondary air going to the furnace, and without an ideal burner there must be even pressure and even density, to get perfect aëration.

The CHAIRMAN: What does your Association consider the minimum amount of inerts that a gas could contain?

Mr. SARJANT said he had spoken to an official of the South Metropolitan Gas Company at Olympia that day, and was told 1 p.ct.

Mr. FLATHER said that what was being noticed in Sheffield was also being noticed in other parts of the country, where furnaces were used. They did not think the consumer should be left to the gas companies in a matter such as this.

The CHAIRMAN: In the meantime, as regards Sheffield, is the chief use of gas for furnaces or for domestic purposes, or is it half and half?

Mr. FLATHER replied that during the war it was about two-thirds for industrial purposes and one-third for domestic purposes; but the industrial use now would probably be about half the total.

The CHAIRMAN: Has your Association thought, as regards ordinary domestic lighting, that inerts are equally or not so detrimental?

Mr. FLATHER said the adjustability of the modern incandescent burner was so good that, even with the worst gas that had been supplied at Sheffield, it had been possible to get a moderate light. In other words, incandescent lighting appliances were much more elastic than the industrial furnace and general industrial appliances.

Mr. WELLS said there was a wide variation between the maximum light and the minimum amount it was possible to carry on with. But in the treatment of steel there must be much closer control. The varying density at present made it impossible to get proper burner adjustment; and in this way a large amount of steel was spoiled. As regards the type of furnace in use, the present furnaces were installed on the recommendation of the Gas Company as being entirely suitable for the gas they would supply. The gas, however, had been changed from 560 to 480 B.Th.U., and there was a further possible reduction of 5 p.ct. before the penalty line was reached (if the Company's application now before the Board of Trade was granted), which would bring it down to 456 B.Th.U. When the consumers complained that the furnaces were not working well with this lower quality of gas, the Company said they had a better furnace; and then it turned out that it was a regenerative furnace. His own company had at the present time regenerative furnaces working quite satisfactorily on producer gas; but the enormous amount of capital expenditure which would be involved in changing all their furnaces to the regenerative type would be equivalent to putting-down their own generating plant for producer gas. A small regenerative furnace could not be installed for less than £3000 or £4000. Before the war and during the war, the Sheffield consumers were persuaded to put in furnaces for drying, the design of which was approved by the Gas Company, who supplied the burners. But with the varying quality of the gas these furnaces had become very unsatisfactory.

Dr. LANDER: If you say you cannot use a certain type of gas with

the furnaces you have, I suppose the Company's rejoinder is that you should put in another type of furnace.

Mr. WELLS said that was so; but if they were going to turn out all the existing furnaces, and put in special ones, they might just as well put in producer plant to deal with these new furnaces.

Mr. IMRIE remarked that producer gas could be made for about one-sixth the cost of coal gas.

Mr. WELLS said the point was that the Gas Company had made a bargain with the consumers that the gas to be supplied would suit the furnaces. This bargain was not being kept by the Company. The consumers did not expect the Company to turn round and supply gas of a lower calorific value and with a higher percentage of inerts.

The CHAIRMAN: Your practical experience at the present time is that the furnaces you have installed at the suggestion of the Gas Company do not work satisfactorily.

Mr. WELLS: They do not to-day.

The CHAIRMAN: And in your view, that is because of the inerts in the gas.

Mr. WELLS said he was only taking the assertions of the Sheffield gas manager who stated that with 20-10ths, the pressure was all right, and that 480 B.Th.U. gas gave a satisfactory result. As a matter of fact, the pressure was above the 20-10ths (on the previous day it was 32-10ths) and the calorific value was 494 B.Th.U.; yet the furnaces did not work as satisfactorily as they did with the 560 B.Th.U. gas. As according to the gas manager it could not be the calorific value or the pressure, there was only the inerts left. The Sheffield consumers were dissatisfied because they now had to use 25 to 50 p.ct. more gas to do the same operations as before the war, with a correspondingly longer time in the furnace, which meant higher labour charges.

Dr. LANDER said that, looking at the records of gas supplied during the war, he had been struck by the frightful fluctuations; and in these circumstances furnaces could not be adjusted to deal with the minimum. He would like to know, however, how far it was thought they had got away from the war period, and whether it was possible to separate-out definitely the effects of inerts and of fluctuations.

Mr. WELLS said that at the present time the calorific value was constant except during the night hours; and the pressure was also satisfactory, except in one or two remote parts of the district.

Dr. LANDER suggested that there was no reason why the furnaces should not be set at their maximum efficiency, assuming a constant pressure and a constant calorific value. When so set, apparently there was still trouble from some cause which the witnesses attributed to the inerts.

Mr. IMRIE said that the furnaces in many cases had been set by the Gas Company's own experts, who were trying to convince the consumers that a further drop in the calorific value which they were going to inflict upon the district arbitrarily would not injure the consumers. His firm, which used a very large quantity of gas during the year, was already changing-over some of its furnaces to solid fuel, because it was simply impossible to go on as they were.

In answer to the Chairman,

Mr. FLATHER said they thought some such limit should be imposed upon the inerts as was contained in the recommendation of the Fuel Research Board. At that conference, representatives of the National Gas Council were present; and the figures were unanimously agreed to of 20 p.ct. for two years, 18 p.ct. for a further two years, and then a maximum of 15 p.ct. The users would have liked the figure fixed lower than this, but it was a question of coming to an agreement. He repeated that he thought some independent tests should be carried-out as to the effects of varying percentages of inerts.

The CHAIRMAN said the Committee had no authority to order such tests to be made; but it did want to know if anyone could give the results of tests that had already been made. Such information would assist the Committee in drawing-up a report, which it had to do on the information supplied to it.

Mr. WELLS thought that the Gas Regulation Bill, as originally drafted, contained a clause embodying the recommendation of the Fuel Research Board; and it was anticipated that the clause would have remained in. It was suddenly snatched-out at the instance of the gas interests, however, and the matter relegated to a further inquiry. It was therefore for the gas interests to prove that inerts did not prejudicially affect the consumer rather than for the consumer to prove that they did.

The CHAIRMAN remarked that the Committee would be quite willing to get the information from anybody.

Mr. WELLS said it was the gas company which had changed the conditions, and not the consumers. At the present time, the consumers were being told that certain things were best for them. They were thrown at the heads of the consumers, who had to pay the piper. He wished specially to impress on the Committee the importance of the matter to a company like his own, whose gas bill had increased from £6000 in 1917 to £14,500 in 1920.

Mr. BUTTERFIELD asked how much of the grievance was due to decreased calorific value, and how much to inerts. Under the Act, the Gas Company could declare any calorific value—say, 400 B.Th.U.—and supposing they supplied such a gas, with a limited proportion of inerts, would the difficulties complained of be overcome?

Mr. WELLS considered a drop from 500 to 400 B.Th.U. was too great. In fact, this was part of the complaint—that the value had already dropped from 560 to 480 B.Th.U.

Mr. BUTTERFIELD: So that the limitation of the inerts would not necessarily secure you the gas you want.

Mr. WELLS: No.

Mr. BUTTERFIELD: Because the Gas Company would still be able to declare a low calorific value.

Mr. WELLS thought it was only fair to consider the inerts with other conditions. He did not see that the consumer should be asked to decide whether a gas of low calorific value and low inerts would suit him better than gas of high calorific value and high inerts. To consider the effect of inerts, they must have regard to gas of constant calorific value and pressure.

Mr. BUTTERFIELD merely wanted to be quite clear as to how far the present difficulties were due to calorific power or inerts.

Mr. FLATHER said this was really only a hypothetical proposition, and could only be answered by an opinion which, in the present case, would be on the lines that, as the appliances in use were installed for gas of high caloric power and low inerts, they would not be adjustable for gas of low calorific power and high inerts.

Mr. BUTTERFIELD said this was the point he wanted to get clear. He took it that the Sheffield Gas Consumers' Association believed it had sufficient proof that for the same calorific value, low inerts were very much better.

Mr. WELLS: Undoubtedly.

Dr. HUTTON said that if gas of 400 B.Th.U. were to be declared in Sheffield, the users for industrial purposes might just as well shut-down their gas appliances as soon as they possibly could.

Mr. BUTTERFIELD: You might be inclined to use a 480 B.Th.U. gas with low inerts, whereas a 400 B.Th.U. gas with high inerts would be impossible.

Dr. HUTTON: Exactly.

In the course of further discussion, another reference was made to the report of the Gas Investigation Committee of the Institution of Gas Engineers, and particularly to the tests on p. 64. Mr. Butterfield pointed out that there was a variation in density between two gases of ·546 and ·516, and asked whether such a variation would be considered serious.

Mr. SARJANT said the exact degree of importance there was difficult to define in the absence of reliable data obtained under working conditions. Therefore it could only be argued from *a priori* evidence that extreme fluctuations were deleterious.

Mr. BUTTERFIELD: Extreme fluctuations of density concomitant with extreme fluctuations of calorific value.

Mr. SARJANT agreed, and added that there was no guarantee that there would not be extreme fluctuations of calorific value. There had been trouble with both calorific value and inerts; but it was impossible to say definitely how much of the trouble was due to each.

The CHAIRMAN said it might be that the trouble was due to one or either or both. It was to enable the Committee to come to some definite conclusion that they wished to get all information possible.

Mr. SARJANT remarked that the opinion of the members of the Association was that inerts were deleterious.

Mr. WELLS: We have more or less satisfactory calorific value and pressure, and yet our troubles have not disappeared.

Mr. BUTTERFIELD asked if any considerable excess of air was used.

Mr. SARJANT said that as the result of many tests, he had satisfied himself they were getting perfect aëration; but this was only obtained by careful watching and by carefully selecting men for the work. In this way they got inappreciable quantities of excess air. It was not easy to have excess air owing to the oxidizing effect on the forge.

Mr. WELLS said that the prospect before them was that the calorific value of the gas would be still further reduced, and instead of getting coal gas (which was fairly dependable) they would get coal gas, blue water gas, coke-oven gas, and producer gas. They were, in fact, getting that to-day, and were entirely in the hands of the Company.

The CHAIRMAN pointed out that the calorific value had fallen from 570 in 1919 to as low as 448 in 1920, according to the figures handed in. Might not this variation in the calorific value alone account for the troubles that had been experienced?

Mr. IMRIE said they had reduced the calorific value of the gas in Sheffield by adding flue-gases. It was not thought right that the Gas Company should be allowed to fix the calorific value of their gas. If they chose, they could supply producer gas; and he was certain the Fuel Research Board had no such thing in contemplation as a town gas supply. Indeed, in the report of the Board dealing with the matter, reference was made to the supply of producer gas through separate mains.

Mr. IMRIE pointed out that the big variation in the calorific value to which the Chairman had referred was over a month. At the present time it was necessary to adjust the burners of the furnaces sometimes from hour to hour.

Mr. BUTTERFIELD, in the course of further questions, said he wanted to be quite sure that increased pressure was not part of the trouble.

Mr. WELLS did not think so.

Mr. SARJANT said that as things stood at present, the consumer did not know where he was going to be landed—he might have carburetted producer gas or something like that, for all he knew. He ought to be protected.

Mr. BUTTERFIELD: Then you think that, even with a constant calorific value and constant pressure, there should still be a limitation of inerts?

Mr. SARJANT: We think a restriction of inerts is the means of getting the former.

Mr. WELLS asked the Committee to keep in mind that the consumers in Sheffield had incurred a large capital cost on the representations of the Gas Company that the gas supplied would suit the furnaces. The Company now had arbitrary powers to change the gas they proposed to use, and the consumers had no redress.

Mr. BUTTERFIELD: I appreciate fully your position and difficulties, and I want to be quite sure to what extent a limitation of inerts will help you.

Mr. WELLS said such a limitation was the only straw the consumer could grasp at to save being drowned.

Mr. SARJANT remarked that if gas companies were so very keen not to have a limitation, there must be something that was not to the advantage of the consumer.

The CHAIRMAN: Not necessarily.

Mr. SARJANT: Well, there must be something to the advantage of the gas companies.

Mr. BUTTERFIELD suggested that it might have the effect of enabling the gas companies to distribute heat units more cheaply. He took it that the Sheffield consumers did not want these heat units *plus* the inerts, even if the price was lower.

Mr. SARJANT said they certainly wanted them at a lower price, and they would be very foolish not to take them.

Dr. HUTTON considered that, on the other hand, it might be cheaper to continue to have dearer gas with low inerts if the capital cost involved in new plant to use the gas with high inerts was so large that it wiped-out the advantage of the cheaper heat units.

Mr. SARJANT referred also to difficulties in getting through the mains gas with higher inerts, owing to the extra pressure which would be involved. The existing mains would not stand too high a pressure; and their position in the works was such that renewals were almost impossible. Moreover, higher pressure meant greater leakage. Already the pipes in his works had had 50 p ct. increase in the load put upon them since they started, owing to the installation of additional furnaces. Again, this higher pressure meant a longer flame, which would be useless for such purposes as drying moulds and cores, for which a short flame was required.

MR. BUTTERFIELD: And if you change the pressure to get this shorter flame, you have uneven pressure at different points in the works?

Mr. SARJANT: That is so. Continuing, he said he did not want these higher pressures. On the previous morning the pressure at his works had gone up to 32-10ths, and on one occasion it had been 40-10ths.

Dr. HUTTON reiterated that the Sheffield consumers objected to being placed at the mercy of the Gas Company in the way they would be if the limitation of inerts on the lines suggested was not adopted. He submitted that the large users had considerable sums involved in their equipment the same as the Gas Company, and should have consideration. The Gas Company had a monopoly granted them in the first instance to supply coal gas; and the appliances on consumers' premises had been adapted to burn coal gas. When the Company wished to supply coke-oven gas, it had to go to Parliament for powers; but under the Gas Regulation Act the Company, unless inerts were controlled, would be able to proceed by enormously greater steps and take enormously greater risks so far as the consumer was concerned. From supplying gas of a usable quality, they could supply one which would sweep-away large batches of their consumers. The answer to this might be that no gas company would do anything of the sort. But there was ample evidence that the Sheffield Gas Company took very little heed indeed of the requirements of its consumers; and unless protection was given in the form of Government control of the quantity of inerts, the consumers would be absolutely at the mercy of the Company. There was evidence from within the gas industry itself in favour of the views placed before the Committee that day. Sir Dugald Clerk, in his Presidential Address to the Institution of Gas Engineers, had warned the gas industry against passing straight to this poor quality gas; and other leaders of the industry had spoken much to the same effect. He looked forward to experimental evidence being available which would enable the use of lower quality gas by progressive stages; but he protested against gas undertakings being allowed a free hand to jump at once to such gases, before there was evidence from either the Fuel Research Board or the Gas Investigation Committee that it would be advantageous to do so. The Gas Investigation Committee itself had stated (it had also been mentioned in discussions) that no evidence was as yet available to justify any considerable change at the present time. Eminent men in the gas industry had warned their own people that the case of the mantle and the gas-fire was not parallel with the furnace. Dr. E. W. Smith, the late Chief Chemist of the Birmingham Corporation gas undertaking, had stated that furnace work was under entirely different conditions; and the Sheffield Gas Consumers' Association had appealed to the Fuel Research Board to carry out investigations on the matter. He understood there was a certain prospect of the Board being able to do this.

Mr. FLATHER said they were not pigheaded, and were quite open to be convinced. It might be possible for a limitation such as was asked for to be placed upon the proportion of inerts for a certain period, during which time research could be carried out and further evidence as to the actual facts obtained.

Mr. BUTTERFIELD asked if any case existed in which blue water gas made on the works had been used for furnace work.

Mr. WELLS said the general opinion among steel makers was that hydrogen was deleterious as increasing scaling. It was bad for drying as well. There was a case on record where blue water gas having a calorific value of 250 B.Th.U. was used for steel melting and did not give such satisfactory results as a straight producer gas of 140 B.Th.U.

Mr. BUTTERFIELD said that in this case the gas with the higher inerts was better because of the effect of water gas on steel.

The Committee then adjourned.

Bromsgrove Gas Light Company.—At the annual meeting (Mr. J. Green presiding) the report and accounts, which showed a profit of £1308, were approved. The disposable balance, with the sum brought forward, was £3928; and it was decided to pay dividends for the year of 8 p.ct. on the original shares, and £5 12s. p.ct. on the "B" shares, less income-tax, leaving to be carried forward £2636. Mr. Green stated that this was the first time for many years that the Directors had found it necessary to recommend a reduced rate of dividend. The root cause was the high cost of coals and labour. An outstanding feature of the year's working was an increase of over 10 million c.ft. in the make of gas—the largest increase they had ever recorded.

Sunderland Gas Company.—The report and balance-sheet of the Sunderland Gas Company show that for 1920 the receipts on revenue account amounted to £395,806, which includes £117,109 from sales of gas and £273,107 from the sale of residual products. After meeting expenses, there is a balance to net revenue account of £12,763, compared with £13,753 the previous year. An interim dividend was paid in September last of 5 p.ct. on the original stock and 4¼ p.ct. on the additional capital stock of the Company; and the Directors now recommend the declaration of an equivalent dividend on the converted stock—viz., 3 p.ct. (less income-tax). During the year the gas undertakings of South Hylton and Whitburn were acquired; and gas is now supplied from Sunderland to these districts by high-pressure mains. The gas manufactured was the largest amount in the history of the Company—1,592,701,000 c.ft., an increase of 19·63 p.ct. over the previous year. New manufacturing plant to meet the demand has been erected, and further extensions are in progress. In order to meet the expenditure for these extensions, the Directors have decided to sell by auction at the close of the annual meeting £20,000 of ordinary capital stock, being part of the additional capital authorized by the Act of 1919, the maximum dividend on which is limited to 6 p.ct.

SOUTH SUBURBAN GAS COMPANY.

The Annual Ordinary Meeting was held last Friday, at the Cannon Street Hotel, E.C.—Mr. CHARLES HUNT, M.Inst.C.E., in the chair.

The SECRETARY (Mr. Wilfrid Wastell) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

A MEMORABLE BUT CRITICAL YEAR.

The CHAIRMAN, in moving the adoption of the report and accounts, said: The year of which we have now the pleasure to submit our record was made memorable by the passing through Parliament of the long promised measure for the financial relief of gas companies—a measure which, as I took the opportunity of saying at our meeting last autumn, is likely to favourably influence the fortunes of these undertakings for many years to come. At the same time, the year proved to be an exceptionally embarrassing one, chiefly from the persistent and general soaring of prices, which, it is no exaggeration to say, set calculations at defiance, and which culminated at the end of the year in the coal strike, and the subsequent collapse of the markets for residuals. When the drastic Order of the then Coal Controller in 1919 practically cut this Company off from the Midlands, and compelled us to use seaborne coal, thus necessitating a very large addition to the cost of manufacture, permission was given by the Board of Trade for a correspondingly large addition to the price of gas. This permission was not fully exercised at the time; the change from Midland to Durham coal having proceeded rather more slowly than was anticipated. But last year it became necessary to raise the price of gas to the fullest extent authorized by the Board of Trade Order. In fact, but for the advent of the Gas Regulation Act, 1920, it might have become necessary to apply to the Board of Trade for a new Order. This, however, and the then improving market for residuals, inclined us to take the risk of not doing so.

INCREASED GAS CONSUMPTION AND CAPITAL EXPENDITURE—A STRONG POSITION.

The accounts show how exceedingly well residuals came to the relief of a position which was a very anxious one, though, for being able to make both ends meet, much is also due to a record increase of 8·26 p.ct. in gas consumption. This increase brings up the total sales for the year (including Dartford) to 2942 millions, as compared with the pre-war figure of 2126 million cubic feet; representing an increase of 38·3 p.ct., or, excluding Dartford, of about 29 p.ct. This comparison is, however, hardly complete without the addition of figures which always appeal strongly to those who follow the fortunes of gas undertakings, and to gas experts in particular. These show that the amount of capital employed per 1000 c.ft. sold has been reduced during the same war period from 9s. 11d. to 8s. 7d., or 13·4 p.ct. Apart, moreover, from depreciation of investments, in regard to which this Company has not escaped the common lot, there has been no sensible reduction of either reserve fund or special purposes fund throughout the war period. These particulars, together with the constant increase in the number of consumers (1842 last year, making 82,141 in all) show that the position of the Company has not only not been weakened, but has actually been greatly strengthened during the war period. They cannot but inspire confidence in the future of the undertaking. It may be as well to place them on record, now that a new departure is being taken under the Gas Regulation Act; and it may be the last time we shall be able to speak of "cubic feet" in this connection.

BYE-PRODUCTS RETURNS GOOD; BUT THE FUTURE A MATTER FOR DEEP CONCERN.

With reference to residuals, I ought to say that we did not "join the glad throng" of coke exporters, for the simple reason that the Fuel Overseer confined this Company to the more prosaic task of supplying home requirements. This Cinderella-like attitude was not, however, altogether without advantage, since the disposal abroad of huge quantities of coke had the inevitable effect of keeping-up prices at home; and we were perhaps saved from some embarrassment when the fun came to an end. I read not long ago of a worthy Chairman of a Gas Committee who felt himself humiliated by having to raise the price of gas, apparently for no other reason than that he could no longer make the foreigner pay. From such a feeling as that, whether justified or not, we have at all events been spared. It will be noticed that, in the return for residuals, tar figures for an amount which I may say is greater than has ever before been realized by this Company—due, it is understood, to an exceptional demand for pitch. Residuals as a whole yielded per 1000 c.ft. of gas sold nearly three times as much as they did in 1914; the actual figures being 8·83d. for that year, and 23·89d. for last year. But the remarkably swift change that has recently come over the markets for residuals, particularly that for coke, is a matter of deep concern, especially bearing in mind that the higher the rise, the greater may be the fall. Having regard to the fact that last year's trading profit, in spite of these exceptional returns, did but little more than yield our statutory dividend, it is difficult to see how another rise in the price of gas can be avoided. However, we can but hope that the present depression may not be of long duration.

DEBENTURE STOCK ISSUE.

The Public Utility Companies (Capital Issues) Act, which was the occasion of our meeting last August, while giving some much-needed facilities for raising additional capital, is chiefly of interest to this Company from its extension of borrowing powers. The concession in this respect was in the opinion of many long overdue; it having been difficult to understand how the position of debenture holders is in any way strengthened by the restriction of borrowing powers to one-third of the paid-up capital. The Melbourne Gas Company in Australia have always had, since their incorporation in 1877, borrowing powers to the full amount of their paid-up capital, and such powers have been renewed in respect of additional capital recently granted. Agreeably with the authority given us at the extraordinary meeting, we recently offered for subscription 7 p.ct. redeemable debentures to the extent of

£150,000, the greater portion of which was taken up, mainly, it is very gratifying to be able to say, by the Company's consumers, stockholders, and co-partners. A lady stockholder inquired why so much as 7 p.ct. was being offered for this new money, seeing that she was getting only 3¾ p.ct. on her ordinary stock. That is a very natural question, and is only half answered by the statement that the new money would not have been subscribed on lower terms. What really impresses the imagination is the comparison between the rate of interest which has now to be paid for additional capital urgently needed to carry on the business, and the very meagre dividend to which the ordinary stockholder has for some years been condemned, notwithstanding the special services—the very special services in fact—rendered by the gas industry during the war, and which could not have been rendered by any other industry that was not connected with the carbonization of coal. These services, be it remembered were in no way profitable to the undertakers, for the Government fixed their own prices for everything required from us, which is as much as to say that the Company were losers rather than gainers by their wartime customer.

THE GAS REGULATION ACT.

Happily, however, a better time is now at hand; and under the Gas Regulation Act we have good reason to hope for improved dividends, commencing, it may be, next half year. The Act provides that our pre-war position is to be restored so far as it is in the power of the Government to restore it. That which they cannot restore is partly indicated by our having had to sell the Company's war loan stock at a loss, although this loss has been fully written-off in the present accounts. There is, of course, no undertaking to relieve either Company or individual from the financial burdens imposed by the war. What the Gas Regulation Act empowers the Board of Trade to do is to grant a new standard or maximum price expressed in heat units—that is to say, at per therm of 100,000 B.Th.U.—by adding to the old standard price (which in our case was a very low one, 2s. 9d.) or maximum price, as the case may be, such sum "as appears to the Board of Trade reasonably required in order to meet the increases (if any) due to circumstances beyond the control of, or which could not reasonably have been avoided by, the undertaking, which have occurred since the 30th day of June, 1914, in the costs and charges of, and incidental to, the production and supply of gas by the undertakers." No alteration in the operation of the sliding-scale where such exists is contemplated by the Act—in fact, it was, if I remember rightly, so stated during the discussion on the measure in Parliament.

NO QUARREL WITH THE SLIDING-SCALE.

I need hardly say that we have no sort of quarrel with the sliding-scale. Our quarrel (if such it may be termed) is with the wholly unforeseen circumstances which made it unworkable and ruinous to the companies; and our lasting regret is that no provision whatever had ever been thought necessary to meet such circumstances. I happen to be old enough—much more than old enough, unfortunately—to remember the time when there was no sliding-scale. My first service with a gas company commenced in 1857—more than sixty-three years ago, ever since which time I have been more or less a student of gas politics. The sliding-scale gave peace to the gas industry for nearly forty years. I do not mean to say that there were no disputes with local authorities during that long period, for such is not the fact. But what disputes there were mainly concerned matters more or less indicative of a progressive industry, such as changes of testing burner, or quality of gas, capital requirements, and such like. The point is that, with the fixing of a standard price, came to an end the somewhat sordid disputes as to what should be the selling price of gas, which had previously occupied much of the time of local authorities and Parliament. Local authorities became satisfied as soon as it was settled that upon the price of gas depended the dividend paid to shareholders; and shareholders were gratified by the increased dividends which the sliding-scale almost invariably brought in its train. We never can, we must never, forget to honour the memory of the man to whom of all others this long-continued peace was due—the late Sir George Livesey—who practically originated the sliding-scale as applied to the gas industry. He fought for it in the seventies, and was one of the first, although not the first, to adopt it, much to the satisfaction of his shareholders. I rather think that at that time the proposal was made that the slide should only operate one way. Had this been then agreed to, the gas history of the last few years might have had to be written differently. However, all went satisfactorily enough, until in 1914 came the unexpected—and everybody knows what has happened since then. In the absence of any provision for revision in any circumstances whatever, gas companies were wholly at the mercy of Parliament, who, in justice be it said, did what it could for their relief. But it is a great satisfaction to feel that the new Act supplies the omission which was fatal to the sliding-scale under war conditions.

THE REVISION SUPPLEMENT TO THE SLIDING-SCALE.

I think I mentioned this at our meeting last autumn; but the matter is so important that I hope you will bear with me if I try to emphasize it. We have already seen that the companies are to be restored to their pre-war positions; so that this Company may reasonably expect to pay something approaching to pre-war dividends. I cannot say that there is an immediate prospect of a return to 6 p.ct.; but whatever we find ourselves in a position to recommend the payment of is practically ensured by the provision in the Act that if at any time—at any time, be it noted—it is shown to the satisfaction of the Board of Trade that the costs and charges already referred to have substantially altered from circumstances beyond the control of, or which could not reasonably have been avoided by, the undertakers, the Order given to the undertakers may be revised accordingly. Such revision is to apply either way, according to the circumstances. The Company, as a matter of course, retain the full advantage of any improvement in the manufacture or supply of gas—in other words, of the exercise of due care and management. This fully accords with the principle of the sliding-scale; and had any such provision applied during the war, it should have completely saved the situation. We of this Company may claim the credit of having practically anticipated this very important provision by the revision clause in our Act of last session.

PROVISION FOR CO-PARTNERSHIP—THE WORKS COMMITTEE.

I should like to mention that in our application to the Board of Trade for an Order for the new standard price, a sum equivalent to 7½ p.ct. (or the rate of our pre-war bonus) on the present wages and salaries is included for co-partnership; it being felt to be only right that the pre-war position of the Company's co-partners should be restored as well as that of the Company. It is hoped that the equity of this claim may be fully recognized. I am glad to be able also to add that the Works Committee, to the formation of which I referred at the last annual general meeting of the shareholders, continues to give complete satisfaction; and we have come to regard it as an indispensable adjunct to co-partnership. I may take this opportunity of explaining that this is not a Whitley Committee, nor is it a Co-Partnership Committee as usually constituted. It is a committee composed exclusively of the workmen members of the Co-Partnership Committee, who are all elected by the workmen, and they have their own Chairman and Secretary, and hold their meetings entirely by themselves. In the opinion of the management, this is the only way which can result in the fullest and freest expression of views; and I have recently been assured by a workman whose opinion I value that it seems next to impossible for most workmen to express their views freely in the presence of officials. Anyhow, the system continues to give satisfaction to everybody concerned; and so long as this is so, we are not likely to change it for the Whitley or for any other system of Works Committee. I may add that when recently called upon, quite unexpectedly, to say a word or two on our experience of co-partnership at a meeting held to consider the subject, a previous speaker had commented upon the great amount of suspicion and unrest existing at the present time among both employers and employed. It appeared to me to be *a propos* of this to say something of the origin and formation of our Works Committee, and its wonderful success; and I concluded by remarking that the moral of it all appeared to be that "if you trust your workmen, they will not betray you; if you give them your confidence, they will give you their confidence in return." Confidence, to be effective, must be mutual; and mutual confidence is co-partnership.

EXPANSION OF CUSTOM THE GUARANTEE OF STABILITY.

The DEPUTY-CHAIRMAN (Sir Fortescue Flannery, Bart., M.P.), in seconding the motion, said the speech of the Chairman had been much more comprehensive even than it usually was, though from year to year it served, if he might venture to say so, as a model for the chairmen of gas companies throughout the country. There were three points that he was sure the proprietors would emphasize in their own minds. The first was that the business was increasing not merely in the sale of gas, but in the number of customers. He himself attached as much importance to the increase in the number of customers as he did to the increase in the amount of gas sold, because during the war they had more than one considerable trade customer whose patronage depended largely upon war manufacture, and as war ceased munitions making ceased, and this source of trade for the Company ended. Therefore, they welcomed all the more the increase in the number of the smaller consumers. When the proprietors were looking forward to the prospects of the Company, and to what might happen to their investments, he thought they would derive a great deal of encouragement from the fact that not only had the Company a record increase in gas sold, but they had also a very large addition to the number of consumers. One other point that the Chairman mentioned, he (Sir Fortescue) thought could not be emphasized too strongly—that was, the continued success of the co-partnership system. The Works Committee was, as the Chairman had said, working absolutely to the satisfaction of everybody concerned. It worked not only independently of, but it worked in harmony with, the Co-Partnership Committee, the meetings of which the Directors and officials attended, though they did not attend those of the Works Committee. But the reflex of the proceedings of both Committees was felt in each of them; and they worked harmoniously and for the good of the concern at large. He felt the proprietors might continue to congratulate themselves on being concerned in an enterprise which was dependent upon a system that, to his mind, had not only brought the greatest harmony between employer and employed, but would be a solution in the future of the labour difficulties under which the country was suffering so harshly to-day.

The motion was unanimously carried.

THE DIVIDEND.

The CHAIRMAN next moved the declaration of a dividend for the half year to Dec. 31 at the rate of 3¾ p.ct. on the ordinary stock, less income-tax. In calling upon Mr. Waller to second the motion, he said that Mr. Waller had been re-elected a member of the Board for the eighth time. This showed the constancy of the employee co-partners to the man of their choice.

Mr. W. G. WALLER seconded the motion, which was adopted.

RE-ELECTIONS.

The CHAIRMAN proposed the re-election of the retiring Directors (Mr. B. R. Green and Mr. Harold Gundry). In doing so, he said his other colleagues would agree with him when he said that these two gentlemen were among the most valuable members of the Board. They gave their time unstintingly to its service; and he was sure their fellow-Directors would be very sorry indeed to lose them. Both were members of a Sub-Committee which had been formed for the purpose of providing a housing scheme of the Company's own, in preparation for the time when they might want it for their workmen at Belvedere. Although this was in abeyance for the time being, they had been able to collect valuable information for the purpose. He might add that Mr. Green had just received his appointment as a member of the Commissioners of Sewers, for which position he was nominated some time ago by the Board. This important body had charge of the reach of the Thames where the Belvedere land is situated.

Dr. CHARLES CARPENTER said he had much pleasure in seconding the proposal for the re-election of two gentlemen whom their colleagues respected so highly.

Mr. SAMUEL SPENCER remarked that he had known Mr. Green since his boyhood. He had watched him all through his career until and

since he joined the Board. They could not have a better man, on account of his knowledge of gas-works and the general business of a gas company.

The motion was heartily agreed to.

Mr. GREEN thanked the proprietors for this renewal of their confidence. He appreciated very fully the privilege it was to him to occupy this position; and he would do his utmost to carry out the duties entrusted to him in the best manner possible,

Mr. GUNDRY also thanked the proprietors very sincerely for having re-elected him a member of the Board. It was a great privilege to be associated with the operations of a Company such as this. There was a harmony in its working which was not known among companies that did not share the blessings of co-partnership. For many years he had believed that the one and only remedy for industrial trouble was co-partnership; and he believed to-day as firmly as ever that, as co-partnership spread throughout the country (and he believed it would, and must, so spread), they would find the frictions and difficulties that were unhappily with them now gradually diminish, and at last fade away altogether. Then they would be left with a peace and prosperity such as they had never known before. He assured the proprietors that he should devote his best energies to the service of their interests.

THE LATE MR. DREW—A NEW AUDITOR.

The CHAIRMAN said the next business was the election of an Auditor in place of Mr. Ernest W. Drew, who, to the great regret of them all, died early in the year. Everybody who knew Mr. Drew respected him. He (the Chairman) was sure they all lamented his loss very much. The election of a successor in his place rested with the proprietors, and notice had been received that the election would be proposed of Mr. Ernest Doige Davey.

Mr. SPENCER moved that Mr. Ernest Doige Davey, A.C.A., be elected to the vacant position. He (Mr. Spencer) had known Mr. Drew since he joined Mr. Lass. It was a great grief to him personally to hear of his death. However, they had now the chance of appointing an excellent and younger man to the position. Mr. Davey was a pupil of Mr. Drew. Since then he had been at the office for twenty years, and was now a partner in the concern. From his own knowledge of Mr. Davey, he did not think they could possibly have a better Auditor.

Mr. CHARLES WEBB seconded the motion, which was carried unanimously.

VOTES OF THANKS.

The CHAIRMAN said that, before separating, he should like to propose a cordial vote of thanks to the chief officers, their staffs, and the employees generally, for their services during the past year. They had in Mr. Terrace, an Engineer of considerable ability; and he (the Chairman) was glad to say he was proving this by his work. They had every reason to be satisfied with him, and were looking forward to great improvements being made by him. Mr. Terrace was naturally a little disappointed that they had to defer starting the new works which had been in contemplation for some time. But he had found there was life in the old works still; and the fact that he was able to meet a record increase in the consumption last year of 8·26 p.ct. showed that he had the capacity for drawing the most out of them. Mr. Terrace was ably supported by his staff; and he could say the same also of Mr. Wastell, who was equally well supported. He (the Chairman) was sure they could not have a better staff than they had to carry on the business.

Mr. H. W. SMITH seconded the motion, which was heartily passed.

Mr. JOHN TERRACE (Chief Engineer) thanked the Chairman for his kind words, and said he wished to assure the proprietors that to serve the interests of the Company was his foremost object in life. He was pleased to hear the Chairman, in mentioning the chief officers, also remark as to how well the Company were served by those under them. So much had been said on the subject of co-partnership that he did not feel he need say more. But he might say he always took every opportunity of impressing not only on the members of the staff but on the workmen that there was a co-partnership in work that was also necessary, and that without their help those who had to direct and manage could do practically nothing. Coming to a big concern like this somewhat over a year ago was naturally something in the nature of a trial. To begin with, one was absolutely dependent upon those under him. But he could say this, that he had had the most loyal support and help from everyone in the engineering department. His colleague, too, the Secretary, had helped him all he possibly could; and it was very essential that there should be at all times harmony between the engineering and secretarial sides of the business. He thanked them on behalf of the engineering staff; and he could give an assurance that they would do all possible to help forward the prosperity of the Company.

Mr. WASTELL said he had to thank the proprietors on behalf of the clerical staff for the kindly references to and endorsement of their efforts, which he was sure would be redoubled in the difficult times that were possibly in front of them. They successfully trod the thorny path from 1914 to the end of the war; and the proprietors need have no fear as to the staff being equal to any demands that might be made upon them. With regard to Mr. Terrace, he should like to say what a pleasure it had been to co-operate with him during the past eighteen months, and in the best interests of the Company.

Mr. CHARLES BEADLE, in proposing a vote of thanks to the Chairman and his colleagues, said it seemed to him they had saved the undertaking. The proprietors were very much indebted to them for the action they had taken, and the success they had brought to the gas industry.

Mr. CHARLES WEBB, in seconding, said he felt convinced if it had not been for the Chairman and the Board they would not have been in the position they were in to-day. Most strenuous times had had to be encountered; and these were likely to continue for some time yet.

The motion was cordially passed.

The CHAIRMAN said his colleagues and himself were much obliged for this kind vote. He could only say they would do all in their power in the future as in the past to further the interests of the Company. He hoped that when they met again the Directors would have the pleasure of offering them a better dividend than they had been receiving the last few years.

BOURNEMOUTH GAS AND WATER COMPANY.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. WILLIAM CASH, F.C.A. (the Chairman), presiding.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting, and the minutes of the previous meeting; and the Directors' report and statement of accounts were taken as read.

ACCOUNTS COVERING A COMPLETE YEAR.

The CHAIRMAN, in moving the adoption of the report and accounts, said this was the first occasion in the history of the Company on which accounts had been presented to the shareholders covering the period of a complete year; and for purposes of reference, and for the information of the proprietors, because it would otherwise not easily be available, the corresponding figures for the year 1919 were printed at the side of the revenue and net revenue accounts. In this way, they would readily be able to see what alterations there might have been in the figures comparing one year with another. Dealing first of all with the domestic affairs of the Company, he would draw their attention to the fact that in the capital account there was shown the nominal amount added on the conversion of the original shares, as sanctioned by Parliament and carried into effect last year. The volume of gas sent out had been some 10½ p.ct. more than in 1919; but the increased receipts from gas were due in a measure to the fact that from July 1 last it had been necessary to raise the price of gas by another 3d. to 4s. 9d. per 1000 c.ft. The average price for 1920 was 4s. 7½d. per 1000 c.ft., as compared with an average price in 1919 of 4s. 1d.

SOME INTERESTING COMPARISONS.

With regard to the amount of business that had been transacted, and dealing first with the gas department, it would no doubt interest shareholders to know that sales of gas last year, at 1422 million c.ft., were almost exactly double what they were only so recently as 1909—eleven years ago. In the same time the number of consumers had gone up from 24,370 to 31,376. Another interesting figure was that relating to the business done in the showrooms. It would be seen that the satisfactory profit of £9265 had been realized on fittings sold. The turnover last year in this department, of course at post-war prices, was more than £33,000, compared with the last pre-war year when the sales amounted to £10,000 odd. Looking back over the expenditure, it was found that coal in 1909 cost 15s. 3d. per ton, and in 1920 48s.; while the price of oil in the former year was 3½d. per gallon, as against 10·8d. last year. Residuals, of course, had come to their assistance, as they had to the assistance of all other undertakings. The total receipts under this head amounted in 1920 to the very substantial sum of £91,984, which represented an increase of £23,839 over 1919. If, however, they turned to the other side, it would be seen that the cost of coal and oil had gone up from £174,067 in 1919 to £218,292 last year, an increase of £44,225. In looking at these figures it must, of course, not be forgotten that a larger quantity was used in 1920, to give the greater output of gas that was required. Oil had been a difficult matter during the year, and their contracts had averaged between 1s. 2d. per gallon in April, 1s. 4d. in May, and as much as 1s. 6d. during December. Since then, he was very glad to say, there had been a reduction (which it was much to be hoped might extend still further) to a price of 1s. 2d., which came about in January. Another satisfactory point was that there had been a very considerable drop in the price of freight; and the Board had been able to charter a steamer for Bournemouth, which would result in some reduction in the price of coal in this respect. Turning to the water department, in 1909 they supplied 16,402 houses, and the water-rental was £39,079. The figures for 1920 were 20,517 houses supplied, and a rental of £50,112. A further interesting figure which emerged from a comparison on this basis was the fact that the average price per 1000 gallons of water in 1920 was rather less than in 1909. The total number of houses supplied to-day was, again, slightly less than in 1916. The water-rental showed an increase in 1920 as compared with 1919 of a little over £1000. Taking the combined businesses together, it would be seen from a note in the revenue account, that there was an increase last year in the total amount paid for wages in all departments of £28,788. Maintenance of works showed a very large increase on the year, which was partly due to the higher cost of material and labour, and was also partly accounted for by the fact that the Directors had made provision to cover the cost of renewals to retorts which was not otherwise covered under contracts now running for repairs to certain vertical retorts. Repairs and maintenance of mains also exhibited a substantial increase, in consequence of there having been carried out a certain amount of enlargement and repair. A year ago he told the shareholders that wages and materials still had a tendency to rise. As a matter of fact, they had on May 1 to pay 1s. additional per man per day or shift; and on July 1 they gave an increase to the office staff. On May 10, there was an increase of 4s. 2d. per ton in the price of coal. A certain measure of anxiety was experienced by the Board in the autumn, when the miners' strike threatened to interfere with their coal. He was glad to say, however, that they had been able to maintain a full supply of gas, by reason of the fact that they held a sufficient stock to tide them over the time of difficulty.

AS TO THE FUTURE.

As to the future, he could tell them that there was a distinct indication in Bournemouth of an increase of business. Building was beginning again; and the Company were laying new mains. There was some tendency, too, in certain directions to a fall in the cost of materials. He ventured to hope that the time had arrived when they might be said to have reached the top of the peak in regard to the cost of labour, coal, and material. But the two essential questions from a national point of view were undoubtedly the position of the mining industry and the position of the railways. Unless these two key industries could see their way to bring down the cost of labour, it would be very difficult indeed for a public utility company, such as a gas and water company, to do anything in the same direction. There would undoubtedly have to be faced in the current year a fall in the price of residuals, due in a measure to the fact that the export trade in coke had practically

vanished, and therefore the competition of the larger companies would affect the price of coke throughout the country. The Board had paid an interim dividend for the half year ended June 30; and as the result of the whole year's operations, it would be seen that the sum which it was proposed to carry forward after paying the dividends now recommended was larger than the sum brought into the account. During the year they had written off from the reserve fund a sufficient sum to provide for the depreciation of their reserve investments.

REMEDIAL MEASURES.

Carrying on the business as they were doing now with the great bulk of their capital at a fixed rate of dividend, all the growth of business and all the savings they were able to effect really fructified for the consumers, and not for the benefit of the shareholders. The Company were in the peculiar position, with a growing business and increased profits, of being able to distribute to their shareholders no larger sum than in pre-war days. Indeed, so far as the original shareholders were concerned, they had suffered a substantial loss. The dividend on the original capital was only £4 16s. 3d. p.ct. To meet this position, he would tell them what it was the Directors were proposing to do. Obviously, it was absurd that they should still be compelled to supply water on the same terms as before the war; and they were seeking from the Ministry of Health an Order to alter this state of affairs. They must have, and were entitled in all equity to have, some increase in the amount they could charge for water. The present position was unfair to the shareholders, and also to the gas consumers. The Company had been in correspondence with the local authorities. As, however, it was quite possible that the Ministry of Health would hold an inquiry, he did not propose to go into details of the matter at the present time. Then they were entitled, under the Gas Regulation Act, to a revision of the standard price of gas in Bournemouth. He thought their thanks were due to the National Gas Council, and to the gentleman who directed the affairs of that organization, for this very valuable piece of legislation, which would be of material assistance to the gas industry.

THE COMPANY'S CAPITAL POWERS.

It was proposed at the conclusion of this meeting to hold an extraordinary general meeting, at which the shareholders would be asked to give the Directors authority to raise additional capital. They might rest assured that the Board would exercise these powers (if they were entrusted with them) only as and when really necessary, and that the usual practice with them would be carried out, of raising the money on the cheapest and best terms available. The present financial position meant that no gas company, or other like undertaking, unless they were absolutely compelled to do so, would embark upon capital expenditure, so long as prices were as high as was the case to-day. While a great deal was being said upon public platforms and in the public press as to the desirability of encouraging export trade, he was quite sure that the state of affairs to which he had just alluded was also largely responsible for unemployment. Apart altogether from questions of export trade, there was a big amount of business to be done, which would require the employment of much labour, if only capital expenditure in this country could be made on a more reasonable basis. The Directors had been compelled to let a contract for a new transporter at Poole, which, with accessories, would run into about £28,000; and they had also been obliged to arrange for additions to the carburetted water-gas plant, at a cost of some £23,000. But other expenditure on new works at Poole, which they had had in view now for some time, would certainly have to wait until prices were more reasonable. The Board would also be faced in the near future with expenditure in respect of the water undertaking, for further trunk mains and additions to the reservoirs and filters. From the facts he had laid before them, it would be gathered that the Directors had had their hands very full, Only as recently as 1919 they were in Parliament; and now they had applications pending to the Ministry of Health and the Board of Trade. There was thus plenty to do in looking after the interests of the shareholders.

EFFICIENT WORK DONE.

As would be remembered, Mr. P. G. G. Moon took over the position of General Manager in succession to their good friend Lieut.-Col. Woodall, in April last; and he must congratulate Mr. Moon on the successful working of the undertaking during the past year. The staff, some of whom were advanced in their positions when the alteration in the post of Chief Officer took place, had also worked extremely well; and he thought he might say that the men were contented to-day with their general position. The Board did endeavour to assist their staff and workmen, and to do all that they could for their happiness and prosperity. In this connection, he might mention that they had just secured a new lease of their football ground, and that the annual sports on this ground last summer were a great success. There was also an excellent band, which was in great demand locally; and there had lately been started a "Co-Partnership Magazine." The annual meeting of their co-partners was marked by great harmony; and the men passed a vote of thanks to the Directors for their consideration in various matters. The Board were about to erect at Poole Hill a war memorial to the Company's men who served in the war, and many of whom, unfortunately, lost their lives. On the subject of the contentment of the employees, he would like to give two or three examples to show the length of time men remained with them. In March last one of the employees, named Cutler, 75 years of age, had been with them 45 years; and, of course, they provided him with a pension. In May another man, named Dunning, 79 years of age, who had been pensioned after 52 years' service with them, died. Tom Brown died in September, after 35 years' service; and Lacey, one of the Co-Partnership Trustees as representing the men, was pensioned off in October, after 38 years' service. Last month a man named Rabbitts was reported as having served 50 years with the Company. These instances, he thought, were sufficient to prove that the men were happy in the Company's employ, and continued in their service for lengthy periods. As showing the way in which the staff worked, he would like to say that during the past year there were 258 houses completed in their gas area; and of these all but five were piped for gas. The total number provided with other means of illumination was only 92. In these 253 houses there were no less than 636 fires or cookers fixed. These figures afforded eloquent testimony to the good work done by the outdoor staff, in showing that gas was by no means an effete commodity.

Lieut.-Col. CHARLES L. MORGAN, C.B.E., formally seconded the motion, which was put to the meeting and carried unanimously.

THE DIVIDENDS.

Proposed by the CHAIRMAN, and seconded by the Right Hon. Sir DANIEL F. GODDARD, the interim dividends to June 30 at the rates of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and 5 p.ct. on the original shares were confirmed; and further dividends were declared (less income-tax) at the rates of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and £4 12s. 6d. on the original shares.

RE-ELECTIONS.

The CHAIRMAN proposed that Lieut.-Col. Morgan be re-elected a Director, remarking that he had been on the Board some time, and that his experience in engineering matters was of great assistance to the Company.

Sir CHARLES J. JESSELL, Bart., seconded the motion, which was agreed to.

The CHAIRMAN then proposed the re-election of Sir Charles Jessel, pointing out that his name was well known in the City, and that he had had a wide experience as Chairman of the Imperial Continental Gas Association.

Mr. E. HONORATUS LLOYD, K.C., seconded the proposition, which was carried.

The retiring Auditor (Mr. R. H. Glen, F.C.A.) was also re-appointed, on the proposition of Lieut.-Col. WOODALL.

VOTES OF THANKS.

The CHAIRMAN said this concluded the formal business; but he had still the pleasant duty to perform of proposing a vote of thanks to Mr. Moon and the other members of the staff and the workpeople. If the shareholders had the time, and cared to take the trouble, to analyze the working results of the Company for the past year, he was sure they would say that these results reflected great credit upon Mr. Moon and the staff. The Company possessed devoted officers, who gave of their very best; and he felt convinced that the workpeople also endeavoured to carry out their duties to the best of their ability. At all events, the officers set them an example which he hoped was emulated. This was not a formal resolution, but a sincere vote of thanks for good services rendered.

Mr. R. H. GLEN cordially seconded the motion, which was carried.

Mr. MOON said, on behalf of himself and the staff and employees at Bournemouth, he thanked the meeting very much for their appreciation of the efforts that had been made. He was glad to think the Directors and shareholders considered that, in spite of the many difficulties and the troubled conditions of the past year, the working had been satisfactory. This was, of course, due in the first place to the wise guidance of the Directors; but it was also due—and he was glad to see the fact recognized—to a very considerable extent to the loyal co-operation and efficient service of the staff and workmen. At Bournemouth, they were a very happy family indeed—a family who were daily realizing more and more the fact that mutual confidence and self-respect were necessary, and who were acquiring this mutual confidence and self-respect. It was very pleasing in these times to be able to testify to the fact that the workers, both staff and men, at Bournemouth were filled with a very excellent spirit of loyalty, and that the Company were splendidly served in every department. They had to thank, he thought, to some extent the successful working of the Co-Partnership and Works Committee for this state of affairs. The Works Committee formed a very excellent medium for the meeting together of the management and men, which enabled them to reason-out and discuss matters to their mutual advantage. At the Works Committee meetings, the policy and plans of the Company, so far as it might be possible to divulge them at the moment, were frankly discussed with the Committee, difficulties were explained, suggestions made, and altogether a real feeling of co-partnership was fostered, which was, he felt quite sure, invaluable to the Company. There was also one other thing which he thought had done quite a lot to stabilize conditions in Bournemouth. This was the pension scheme. Then there were the various social activities, which served to bring the men closer together. All this was why he thought they had a very happy family at Bournemouth; and the family, being happy, was efficient.

Lieut.-Col. HAROLD W. WOODALL proposed a vote of thanks to the Chairman and Directors, and said he would like to refer to the concluding remarks of the Chairman. From what he said, they could be quite sure that the interests of the officials and workmen of the Company were very thoroughly studied, and formed a big portion of the Company's affairs to which the Directors gave their earnest consideration. Much was heard now of labour troubles and solutions; but he thought if they really got to the bottom of things, there was one thing which would put an end to all the difficulties. This was sympathy with the employees on the part of the employers. From the Chairman's speech, they knew that this was very much in the minds of the Directors. If men were treated kindly and sympathetically, he was quite sure they would settle-down and give good hard work, in a way which no other method could secure.

The vote was accorded, and briefly acknowledged by the CHAIRMAN.

Extraordinary Meeting.

An Extraordinary General Meeting was then held for the purpose of: (1) Rescinding the resolutions passed from time to time by the proprietors authorizing the Directors to exercise the borrowing powers of the Company so far as any money shall remain to be borrowed under the authority of such resolutions or any of them; and (2) authorizing the Directors, upon receipt of consent from the Board of Trade, to exercise the borrowing powers of the Company as extended by such consent, by the creation and issue of redeemable debentures or redeemable debenture stock upon terms and conditions specified

The CHAIRMAN, in moving a series of resolutions to give effect to the proposals of the Directors, said that from time to time the share-

holders had given the Board authority to borrow certain moneys under the different Acts of Parliament which regulated the Company's business. The Directors, however, desired now to make a new and completely different issue from anything before. What was proposed was to exercise existing borrowing powers or extended borrowing powers to be granted by the Board of Trade for a stock which would probably be redeemable. Under the Public Utility Companies (Capital Issues) Act, the Board of Trade were empowered to make an Order increasing the proportionate amount of loan capital that might be borrowed from the figure specified by the particular Act concerned, to a larger proportion, not exceeding one-half of the other capital. The Board intended to make application for an increase of their borrowing powers under this Act; and if the increase were granted, the Order would specify the rate of interest they might pay.

Lieut.-Col. MORGAN seconded the resolutions, which were agreed to.

DERBY GAS COMPANY.

A comparison, to the advantage of privately-managed undertakings in contrast with municipally-owned concerns, was drawn by Alderman W. Hart, speaking at the annual meeting of the Derby Gas Company, on Friday. He pointed to the fact that, under difficult conditions, the Company were able to pay a fairly substantial dividend, whereas the municipal water-works were a heavy burden on the rates, the tramways would shortly become so, and at present the electric lighting undertaking was just paying its way. An interim dividend of 2½ p.ct. for the June half year having been paid, the Directors in their report recommended the payment of 2 p.ct. for the period ending December, making 4½ p.ct. for the year, less tax. It was with great regret, they observed, that a further reduction of the authorized rate of dividend became necessary under existing sliding-scale conditions. The sale of gas for the year, as compared with 1919, had increased by just over 184½ million c.ft., being 13·4 p.ct. more. In consequence of the large increase in the cost of coal, materials, and labour, the charge for gas on July 1 last was increased from 3s. 1d. to 3s. 9d. per 1000 c ft., resulting in a reduction of dividend which could be paid on the ordinary stock to £4 p.ct. The Directors had applied to the Board of Trade for an Order under the Gas Regulation Act, 1920, amending the standard price of gas sold by the Company, and there was every reason to hope that an Order would be made increasing the standard price, so that a dividend could be paid on the ordinary stock more in accordance with the present value of money than the existing low rate of £4 p.ct. per annum.

Mr. J. W. NEWBOULD, who presided, said that he did not view the present state of trade without hope. The needs of the whole world were great and urgent; and he believed they would emerge from the present gloomy outlook into brighter conditions before long. It was very essential, in the interest of commercial prosperity, that the cost of coal should be reduced; and one could only hope that the owners and miners would be able to find a basis which would give each an equitable return without the price of coal being fixed at such a high level as would strangle industry. Most people regarded the coming decontrol of coal with relief, as under Government control the quality had deteriorated and prices had enormously advanced. The present excessive taxation crippled industry, and tended towards unemployment. He alluded to the importance of the residual products, which amounted to about 43 p.ct. of the total revenue; they having realized £191,652—an increase of £74,659. The Company's pre-war dividend was 6 p.ct., and it was reduced to 4½ p.ct. now. This was due to the working of an unfair sliding-scale, whereby an increase charged in the price of gas automatically reduced the dividend.

The report was adopted, and the retiring Directors were re-elected.

Westminster Public Lighting.

The Works Committee reported, at the meeting of the Westminster City Council last Thursday, the receipt of a letter from the Gas Light and Coke Company, notifying the increase in the price of gas in the Company's district north of the Thames from 4s. 8d. to 5s. 6d. per 1000 c.ft. as from Jan. 26. Under the terms of the agreement for public lighting between the Company and the Council, the Company's charges for gas for street lighting will be increased 33⅓ p.ct. over the price charged in the original contract for 1910. The Company had also notified the City Engineer of increases of charges for 89 street-lamps not included in their contract for public lighting. The lamps are in special positions, and of a special character. The Company stated that they had made no increase in their charges for these lamps, in spite of the rise in cost of labour and materials due to the war. They proposed to substitute, for the existing (average) charges of 17s. 2d. for lighting, extinguishing, and cleaning, 7s. 6d. per lamp per per annum for repairs, and 6s. per burner per annum for mantle maintenance, the all-round rates, as from April 1, of 35s., 15s., and 12s. respectively. The Committee recommended payment at these rates; and the Council approved.

Redcar and Coke-Oven Gas.—It was reported at a meeting of the Redcar Urban District Council that Messrs. Dorman, Long, & Co., Ltd., had offered a supply of coke-oven gas from their Warrenby works at 1s. 3d. per 1000 c.ft.; the charge to be on a sliding-scale, varying in accordance with the cost of coal. The matter was left over for consideration at a special meeting of the Council.

Bristol Gas Company.—In the report which was submitted at the meeting last Thursday, the Directors stated that the accounts for the year ended Dec. 31 were, in view of the abnormal conditions, considered satisfactory. An increased sale of gas was reported; and the return from residuals had been highly satisfactory. The price of gas was advanced during the year to meet the further increases in the cost of coal, labour, and materials. The Directors recommended that a dividend be declared for the past half year at the rate of 5 p.ct. per annum on the nominal capital of the Company entitled to dividend, subject to deduction of income-tax.

CROYDON GAS COMPANY.

Half-Yearly Meeting.

Mr. Charles Hussey, J.P., presided at the half-yearly meeting of the Croydon Gas Company last Friday; and, proposing the adoption of the report [*ante*, p. 421] and balance-sheet, he said that they had for the first time passed the thousand million mark in sales of gas for the half year—representing an increase of 74 millions, or nearly 8 p.ct. over 1919, which was an increase of nearly 20 p.ct. over 1918. The fact that the sales showed continued expansion indicated clearly that the convenience and economy of gas were being recognized to an increasing extent. Their prepayment accounts represented during the half year an average consumption of 14,187 c.ft., as compared with 13,012 c.ft. in the corresponding half year. The figures were remarkable. Powers were obtained in December from the Board of Trade to raise capital on terms appropriate to the state of the Money Market at that time; and the whole amount of the issue of £115,000 of debenture stock was applied for within a few days of the lists being open. The residual products had yielded £41,000 more than in the corresponding half year, which represented nearly 10d. per 1000 c.ft. of gas sold. But there had recently been a very serious fall in prices, while the cost of raw materials and of labour showed no corresponding reduction. The Company was one of the earliest to make application to the Board of Trade for an Order under the Gas Regulation Act. A decision on the matter would not be definitely come to for a week to two. It would be a source of legitimate satisfaction if the dividends or be declared now were the last at the reduced rates of recent years.

Mr. T. RIGBY (the Deputy Chairman) seconded the motion, and the report and accounts were unanimously adopted.

Mr. WILLIAM CASH, F.C.A., proposed the payment of the dividends recommended. In doing so, he remarked that for some years now the undertaking was really carried on for the benefit of the consumers. But under the Gas Regulation Act it was to be hoped the conditions would be modified. As to workmen's wages, while having no desire of reverting to pre-war rates, it must be patent to all thinking men that wages must come down, and in this way unemployment would decrease and the cost of living considerably fall.

Mr. H. WOODALL seconded the motion and it was duly passed.

The retiring Directors were unanimously re-elected, and a vote of thanks to the Directors was passed and briefly acknowledged by the Chairman.

The customary vote of thanks to the officers, staff, and workmen was replied to by Mr. W. W. Topley (the Secretary and Accountant), Mr. W. J. Sandeman (the Distributing Engineer and Sales Manager), and Mr. A. Caddick (the Engineer and Works' Manager), the last-named of whom announced that during the cold weather between Dec. 8 and Dec. 20 they were called upon to provide nearly two million cubic feet a day increase on the corresponding period of the previous year.

OPENING OF THE LEEDS GAS EXHIBITION.

The formal opening of the gas exhibition organized by the Leeds City Gas Department [full details of which were given in the "JOURNAL" last week, pp. 400-402] was preceded, on the 15th inst., by a luncheon, in the Lord Mayor's Rooms, at which visitors from other districts and leading members of the gas industry were entertained as the guests of the Chairman (Alderman W. Penrose-Green) and the members of the Leeds Gas Committee. The chair was occupied by Alderman Penrose-Green.

Mr. THOMAS GOULDEN (President of the Institution of Gas Engineers), proposing the toast of "The City of Leeds," spoke in glowing terms of the value of such an exhibition from the point of view of the gas industry and the public health. Mr. Goulden paid tribute to the enterprise of the Leeds Gas Committee, and commented upon the fact that there were 119,000 gas consumers in the city. The present gross revenue of the Leeds gas undertaking, he said, was approximately £1,000,000 a year; and some 250,000 tons of coal were carbonized. He pointed to the enormous wastage of coal which would be avoided, and the great saving of valuable residuals, by the greater use of gas for domestic and industrial purposes. Gas could be employed in industry to a very much larger extent than it was at present; and by this means smoke pollution would be minimized. Coke could also be used much more than it was to replace coal in the heating of boilers. Mr. Goulden described gas as a thing of romance. It was a romance of the sun millions of years ago. When the coal measures were formed, there was probably nothing human on earth; and it was only in these days that the generous rays of the sun of those times ages ago were being put to use by living creatures. What a shame it would be, if these long stored-up treasures were to be wasted by a continuance of coal burning in the open fire, instead of getting the utmost value out of them by the means supplied by the gas industry. Though there was a slump in coal just now, he prophesied that in a short time it would be needed more than ever, and the call for economy would be more than ever urgent. He concluded by paying tribute to the research work in the fuel industry by Prof. Smithells, Prof. Cobb, and other members of the staff of the University of Leeds.

The LORD MAYOR, in response, said they were all proud of their Gas Committee, and of their Gas Department and staff. The Gas Department, particularly through such an exhibition as the present one, were showing the public the many ways in which gas could be used to advantage.

Mr. H. JAMES YATES (Chairman of Radiation, Ltd.), proposing "Success to the Exhibition and to the Leeds Gas Department," said the Corporation were the first body of their kind to renew propaganda work in connection with the use of gas since the war.

The CHAIRMAN, in response, spoke of the good work accomplished by the Gas Department throughout the past year, and hinted that there might be something in the way of a rebate for consumers "when

the right time comes"—and he hoped it would not be far ahead. Quite apart from the question of profit, the Committee had an eye to the health of the citizens and to a cleaner atmosphere and the other health benefits which could be brought about by the greater use of gas.

The brief opening ceremony at the exhibition took place in the garden of the all-gas bungalow. Alderman PENROSE-GREEN presided, and referred to the fact—which he regarded as unique—that the exhibition was actually completed to the last detail before the time of opening. He said this was due in a very large measure to the excellent organization of the arrangements by their Engineer and Manager (Mr. C. S. Shapley) and his staff.

In declaring the exhibition open, the LORD MAYOR (Mr. Albert Braithwaite) said they had heard a good deal lately about municipal trading; but he thought it would be agreed that municipal trading on the lines of the Leeds Gas Department was a success. This occasion was almost like a celebration of the golden wedding of the Gas Committee, because it was in 1870 that the Corporation took over the undertakings of the two Leeds Gas Companies. A look round the exhibition would prove how greatly the gas industry had advanced since that date. Only that day in his own works he had seen the value of gas for industrial purposes. Though he used 400 to 500 tons of coal per week in brick-making, he had a kiln in which the bricks were burned solely by gas; and he was convinced that few industrial concerns would continue to use raw coal if they were made to see the advantages of gas. There was about a million pounds sterling sunk in the Leeds Gas-Works; and, to their credit, the Gas Department turned over an annual revenue of something like an equivalent figure to this.

A vote of thanks to the Lord Mayor was proposed by Alderman J. S. HINCHLIFFE, seconded by Alderman GEO. RATCLIFFE (Deputy Chairman of the Gas Committee), and carried unanimously.

THE LECTURES.

The first of the lectures given in connection with the exhibition was that, on Wednesday evening, by Mr. H. M. Thornton, J.P., the Vice-Chairman and Managing-Director of the Richmond Gas Stove and Meter Company, Limited, who spoke on "Coal Gas: Its Application to Industry." This matter is referred to on p. 486 of to-day's issue.

"Domestic Use and Abuse of Coal Gas" was the subject of a lecture on Thursday by Prof. Smithells, of the Leeds University, who first of all dealt with the modern developments in the gas industry, and said that after the introduction of the incandescent principle, the self-lighting properties of gas became of no account. At the same time, the use of gas in cookers and fires, as well as in engines, enormously increased; so that the overwhelming demand was for heat instead of light. A crisis was reached during the war, when raw materials for explosives ran short, and it became necessary to take out of coal gas some of its most illuminating components. This was done to the extent of 30,000,000 gallons, giving 1,500,000 tons of high explosives. Not only was gas then deprived of the chief illuminating components, but its heating power was compulsorily reduced; the result being that it was very often unsuitable for the appliances in which pre-war gas had been found satisfactory.

Investigations, however, were set on foot by the Institution of Gas Engineers, in conjunction with the Leeds University, as a result of which it was found that larger quantities of gas compensated for the lowered heating power, though it was necessary that appliances should be adjusted to suit the particular gas in use. Following upon the establishment of these facts, the gas industry last year received its "new charter;" and thus had been established the therm. Leeds had applied for power to introduce the new system, which system would no doubt be criticized, as all innovations were. But, so far as his judgment went, not only was there no snare in the new method, but it would be absolutely fair and rational as against a system which had become hopelessly effete and often extraordinarily unjust. In speaking on the domestic use and abuse of gas, Prof. Smithells illustrated his remarks by a series of interesting demonstrations.

On Friday, the subject of "Gas as an Economic Aid to Building Construction" was dealt with [as reported on p. 487] by Major F. Cornelius Wheeler, of the Nautilus Fire Company, Ltd.

MANCHESTER VISITORS.

During Wednesday, the exhibition was visited by the Lord Mayor of Manchester and a party of a dozen members of the City Council. The Lord Mayor (Alderman William Kay) and his colleagues, expressed themselves as highly pleased with the exhibition. Alderman Kay spoke particularly as Chairman of the Manchester Gas Committee, and a gas enthusiast. He commented on the demonstration of the efficacy of modern gas apparatus, in the fact that, with such a vast gathering of stoves and fires alight in one hall, there was no offensive odour. He complimented the Leeds Gas Department on their plans, and the manner in which they had introduced to the public every phase of gas usage.

GAS MANTLES AS A KEY INDUSTRY.

Readers of the "JOURNAL" are aware of the fact that among the industries which are seeking State assistance through the projected Government Bill relating to key industries are the gas-mantle and subsidiary industries. On behalf of these, a statement has been presented to the Board of Trade by the Incandescent Mantle Manufacturers' Association, in the course of which it is pointed out that the gas-mantle industry bases its claim to be regarded as a key industry upon the following considerations:

1.—Both in time of peace and in time of war incandescent gas lighting is necessary for the adequate illumination of docks, railways, factories, &c.

2.—It is estimated that 32 million tons more coal would be required yearly to produce the same illumination if flat-flame burners were used instead of gas-mantles.

3.—The "stripping" of coal gas has been found necessary to ensure adequate supplies of benzole, toluol, and other hydrocarbons for the manufacture of dyes, drugs, and explosives. Such "stripped" gas can only be used as an illuminant in conjunction with the gas-mantle.

The value of the industry from the standpoints of efficient illumination and coal conservation was recognized by Lord Balfour of Burleigh's Committee on Commercial and Industrial Policy; and recent legislation authorizing the sale of gas on a calorific, instead of an illuminating, basis has further emphasized the importance of the gas-mantle. In Germany, the essential nature of this industry, including the raw materials therefor, has been recognized by granting special allocations of coal at the lowest prices, and supplies of gas which are otherwise restricted.

Before the war, the rare-earth chemicals and the gas-mantle industry were mainly under foreign domination. The total output of Indian monazite sand went to Germany; and British mantle-makers had to purchase thorium nitrate abroad at a price fixed by the Thorium Convention—a combine of German and Austrian manufacturers, which was itself controlled by the chief German maker of gas-mantles. Further, foreign mantles were sold in this country at prices from 2 to 35 p.ct. below English factory costs, and from 23 to 70 p.ct. below the selling prices in the countries of origin. In 1913 foreign importations amounted to between 45 and 50 million finished mantles, and over 11 million partly-finished (about 70 p.ct. of our entire consumption); and the latter were marketed in such a way as to evade the payment of British income-tax by the English branch of the German combine—the Auer Gesellschaft. In the same year, the English production was some 22 million mantles, of which 10 millions were made by a company associated with the German combine.

In consequence of this foreign domination, the home industry became very precarious. Nearly all the factories were running at a loss, wages were low, and employment uncertain and unsatisfactory. Hence, at the outbreak of war there was insufficient plant to meet the country's requirements; supplies of thorium nitrate were cut off; and there was a shortage of clay rings and other materials required by the industry. To overcome these difficulties, the Indian monazite deposits were placed under British control, and five home manufacturers took up the preparation of thorium nitrate, though until the factories were ready the nitrate had to be purchased abroad at arbitrary prices which showed large profits to foreign suppliers. These factories can now produce all the gas-mantles the country requires; and during the war they supplied the cerium fluoride and cerium oxalate needed for searchlights and tracer bullets.

Prior to the war, all the mantle-rings required by the home industry were either imported from Germany or supplied by a German-owned company with branch works in this country. These works were purchased by a group of the chief British mantle-makers, and so extended that they are now able to meet the country's requirements, though not yet in a position to produce the full range of designs which were offered by the Germans. Ramie yarn, which was also derived from Germany before the war, can now be supplied by British spinning plants in sufficient quantity to meet all requirements.

Owing to the extensions made to buildings and plant (at war prices), and to the establishment of three or four new factories, the output capacity of the home industry is now over 130 million mantles per annum, which is sufficient to leave a considerable surplus for exportation. The following data show the position of the British industry in 1913 and on Oct. 30, 1920:

	1913.		1919-20.
Output of mantles	32,000,000	..	82,322,000
Capital employed	£440,670	..	£1,525,710*
Workers employed	1843	..	3783

* Exclusive of £350,000 invested in the thorium nitrate and other subsidiary industries.

The present annual consumption of gas-mantles is valued at £1,750,000; while £400,000 is paid in direct wages, and at least an equal sum as indirect wages to convert the imported raw materials into the products used by the industry—labour and wages entering into the cost of the finished article to a degree unusual in other industries. The raw materials used by the gas-mantle manufacturer include thorium nitrate and other chemicals, cotton, ramie, artificial silk, asbestos yarns, clay rings, and cardboard boxes. At the present time, there is grave stagnation in the above trades, which is mainly due to the increasing importation of foreign mantles (over 10 millions in 1920), and the prospect of further competition at prices below British manufacturing costs. The low prices of foreign mantles are the result of:

(*a*) Attempts by foreign makers to recapture their former markets at any cost.
(*b*) The low rate of foreign exchanges.
(*c*) Longer working hours in foreign factories (60 hours or more per week, compared with 48 in this country), and the lower standard of living of the worker.
(*d*) Large pre-war stocks of certain raw materials held by German manufacturers.

The British consumer is not obtaining the full benefit of the lower prices, as the intermediate profit is mainly retained by the importers and dealers. The Labour representatives on the Joint Industrial Council for the industry proposed a resolution, which was passed unanimously, deploring the increasing importation of foreign mantles, and urging the Government to take steps to counteract the effects due to foreign rates of exchange. At the present time, some of the British factories are closed-down, and the rest are working short time; manufacturers are carrying large stocks at a season when demand normally exceeds the rate of production; employment in the industry is declining; and generally the situation is so serious that immediate action is imperative.

In conclusion, it is submitted that the manufacture of thorium and rare-earth salts, incandescent mantles, and clay rings be recognized and assisted as key industries; that legislation be introduced forthwith to protect the British worker against unemployment resulting from foreign competition; and that the British manufacturers who have responded to appeals to lay the foundations of a self-supporting industry be assured of a market free from unfair competition.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under the Gas Regulation Act.

Bridlington Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 7·2d. per therm.

Elland-cum-Greetland Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm. The undertakers have also applied to the Board of Trade to prescribe the additional charge per therm which they may make in respect of gas supplied by means of prepayment meters.

Midsomer Norton Gas and Coke Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. per therm.

Worthing Gas Light and Coke Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6·8d. per therm.

SPECIAL ORDER UNDER SECTION 10.

Staffordshire Potteries Gas.

The British Gas Light Company, Ltd., have applied to the Board of Trade for a Special Order under section 10, to define and regulate the capital expended in connection with their undertaking in the Staffordshire Potteries, and to provide for the expenditure of additional capital.

COAL AND COKE PRICES IN LONDON.

The Board of Trade have approved, under the Profiteering (Amendment) Act, 1920, a scheme submitted by the London Coal Committee for maximum retail prices of coal and coke in the London area.

The scheme follows very closely the general lines of the Household Fuel and Lighting Order, 1918; and the prices and charges now approved (which, pending official sanction, have been in operation for some months) are based on those in force just before control terminated in June, 1920, subject to such modifications as have been necessitated by certain subsequent increases in the costs of bringing coal to London.

It is to be noted that the prices approved are not fixed, but maximum prices. They are based on the maximum pit-head prices under the Mining Industry Act, 1920, and will be liable to variation in the event of variations in these prices or in the cost of transport. The Board of Trade, in approving the scheme, make the reservation that, if at any time in the Board's opinion there is cause to think that for any reason the charges provided for in the scheme should be modified, the Board may require the scheme to be modified accordingly, and that any necessary variations due to an alteration in the pithead prices or in cost of transport shall be notified to, and approved by, the Board of Trade.

Any person who considers that he is charged a price for coal or coke to which this scheme relates in excess of that allowed by, or under, the scheme, should lodge a complaint with the Clerk of the Profiteering Act Local Committee for the district in which the transaction took place.

DR. SALEEBY ON SMOKE ABATEMENT.

Dr. C. W. Saleeby gave an address at the City of London Tradesmen's Club earlier this month, when a letter was read from Mr. F. W. Goodenough, of the Gas Light and Coke Company, who lectured at the previous meeting of the club [as reported in the "JOURNAL" at the time], stating that he was unable to be present, and adding: "I am all the more sorry because, since I had the pleasure of meeting the members of the club last month, the Gas Light and Coke Company have had to make an announcement to their consumers that was very unwelcome to the public, as it was very much regretted by the Company. . . . While, in this present state of uncertainty in all the markets of the world, prophecy would be more than ever 'a gratuitous form of error,' I can say it is the hope and belief that the present high price will not have to be continued for any great length of time."

Dr. Saleeby then proceeded to give his lecture, entitled, "The Smoke Curse and its Effect on National Health and Wealth." He said that, though the industrial chimney was answerable for much, yet the domestic chimney in the large centres of population was likewise answerable for a large share of the dark pall that hung over our cities. He stated that, as a result of his early experiences in Edinburgh, where he had seen the white lungs of a newly-born infant and the grey lungs of an adult, he had not, since that time, purchased an ounce of coal or used an ounce for cooking or heating. Gas in the kitchen both for cooking and heating water, and gas-fires in living and bed rooms, properly fixed with a flue at the back going into the chimney, were some of the means of preventing the atmosphere from being polluted by the smoke of the domestic chimney, as it issued out during the crude and wasteful method of burning coal in the present form of open grates. Neither would he recommend central heating as practised in the United States, as the rooms were made too hot and stuffy, and people leaving them to go out in the open became subject to rheumatism. He instanced the town of Pittsburg, which once had a terrible death-rate from consumption, owing to its polluted air, but was now a clean, healthy city. This change was brought about by the existing laws, which prohibited the production of smoke from the open chimney. The same could be said of New York—once a smoke-laden city, but now absolutely clean. He contrasted this with Manchester, where 50 p.ct. of the sunlight was cut-off and lost by the citizens.

A lengthy discussion took place, followed by a hearty vote of thanks to the lecturer.

FUEL EFFICIENCY.

In connection with the "Daily Mail" Efficiency Exhibition at Olympia, there was last week a series of conferences, arranged by the Higher Production Council, to discuss efficiency from various standpoints.

Tackling the Smoke Nuisance.

Lord NEWTON, who took the chair on Wednesday afternoon, said there were several points upon which the Inter-Departmental Committee on Smoke Pollution (of which he is Chairman) were agreed. One was that this country is, without question, the smokiest and dirtiest in Europe. The Committee, in an interim report, had made certain recommendations which were approved by all who had an interest in the subject; but not the smallest notice had been taken of them, and in houses in process of erection no effort was made to deal with the emission of smoke. The great municipalities were in most cases prepared to deal with the evil as best they could; but greater uniformity in legislation is required.

Papers were read by Dr. H. A. Des Vœux (Hon. Treasurer to the Smoke Abatement Society) and Dr. J. S. Owens.

Gas Fuel Efficiency.

Sir DUGALD CLERK, K.B E., D.Sc., F.R.S., occupied the chair on Thursday afternoon, when the subject of gas was under consideration.

Mr. F. W. GOODENOUGH (Executive Chairman of the British Commercial Gas Association) read a lengthy paper on "Gas Fuel Efficiency," in the course of which he presented many important facts in a clear and forceful manner to his numerous and appreciative audience. Efficiency, he said, is essentially a relative term; and efficiency of any particular means for achieving a desired end can only be usefully considered in comparison with other known means for achieving that end. There is no such obtainable thing as 100 p.ct. efficiency. There is no process devised by man that does not involve some waste. The measure of the efficiency of any process is therefore the relative smallness of the percentage of waste it involves. In considering the efficiency of gaseous fuel, then, it is necessary to ascertain what means exist for achieving the end which is implied in the term "fuel efficiency"—namely, the efficient supply of heat to both homes and industries for the several purposes of warming buildings, of cooking food, of heating water, of carrying on the thousand-and-one industrial processes in which heat is required, and of generating motive power for those in which mechanical energy is essential. Speaking broadly, there is no alternative to coal as the basic fuel in this country. The possible alternatives—wood, peat, oil, and water power—are either impracticable or only available in negligible quantities. And there is no substitute in sight. In ancient mythology, fire was a stolen gift from heaven; but we cannot rely on a second Prometheus to come to our rescue when our coal resources are exhausted—and our coal supplies are by no means unlimited. It is therefore imperative in the highest degree that we should secure the greatest possible percentage of economy—that we should eliminate waste to the utmost—in the production, transport, and utilization of coal.

Now, the author asked, what are the alternative methods of utilizing our national resources of heat and mechanical power—our coal—and what are their relative efficiencies? First, we can use it, as we still in very large measure do use it, by burning it in its crude state in our grates, under our boilers, and under our furnaces. This is the method of direct combustion. Secondly, there is the method of indirect combustion—that of burning the coal under boilers at electric generating stations, transforming the heat into mechanical energy, thence into electrical energy, and then distributing this energy by cable and wire to the points where heat or power is required. Thirdly, there is the method of the distillation (or carbonization) of coal at gas-works, and the distribution thence of the potential energy in gaseous form by mains and pipes to the points where heat or power is required. What becomes of all the valuable products when we burn coal in our fireplaces or under our boilers and furnaces? They are some of them burnt, and give a small amount of heat in the process, but mostly they go up the chimney to befoul the atmosphere, to destroy vegetation, to reduce priceless historic buildings to crumbling dust, to sap the vitality of the dwellers in towns and cities, to stimulate and nourish disease. Is this efficiency or is it waste—waste gross, palpable, and indefensible? We are at present slowly and with great difficulty collecting £250,000 to restore Westminster Abbey, and we shall want many more quarters-of-a-million of pounds to make good the ravages wrought upon other historic buildings in other towns and cities by the inefficient use—the positive abuse—of our coal wealth. And it is not only in the destruction of our buildings that we see the evidences of our waste and want of efficiency in the use of coal. In the small matter of laundry bills alone Manchester spends £250,000 per annum—enough to restore a Westminster Abbey every year—more than would be needed if the air were as clean as that of Harrogate. Is this efficiency, or is it waste? The hospitals and sanatoria are filled with the victims of smoke-shrouded towns and cities—victims created by waste that efficiency would have preserved. We are spending money in enlarging hospitals, sanatoria, and cemeteries, which should be spent in enlarging our gas-works. Is this efficiency, or is it waste—avoidable waste of that most precious national asset, human life?

And is this all the waste involved in burning crude coal? By no means. What of the waste of transport involved in the retail unloading, loading, and cartage of coal, and the retail removal of ashes?

What of the waste of human energy and time in the laying, tending, and clearing-up of fires, in the stoking and clinkering of furnaces, in the carrying to and fro of coals and ashes, in the cleaning of flues, in the cleaning of rooms, and in all the other laborious and dirty work attendant upon the use of the "solid black combustible substance?" What has efficiency to say to these? What, too, of the cost of storage space in factories, and of the money locked-up in carrying big stocks of coal? What of the cost of chimney stacks for factories, and of unnecessarily large flues and chimney-breasts in our houses? It has been estimated—more, it has been proved—that at least £30 (and some competent authorities put it to-day at twice £30) can be saved per small house if, instead of building chimney-flues adequate for the removal of the products of the direct burning of crude coal, there were provided flues only sufficient for the carrying-off of the products of combustion from gas-fires. Is it efficiency or is it waste to go on building houses on the old plan? The Ministry of Health recognize that increased efficiency is possible by this means, and are recommending it to the spending authorities. Public opinion should enforce its adoption by these authorities. If it be true that a million houses will have to be built in the next ten years, is it thinkable that we should deliberately waste anything from £30,000,000 to £60,000,000 on building these houses on a pattern rapidly becoming obsolete?

Turning to another part of his subject, Mr. Goodenough remarked that the great insuperable limitation of electricity as a source of heat and power, in comparison with other sources, is that a given quantity of electrical energy has its precise equivalent in heat or in mechanical energy. We cannot tell the possible limitation in regard to the conversion of a given quantity of electrical energy into light, any more than we can estimate the limitation of the conversion of the heat of a gas-flame into light through the incandescence of rare earths. In both cases we have made enormous advances in the past twenty years; and in both cases we are yet very far from "100 p.ct. efficiency." It is doubtless the fact that we have made such strides in developing the efficiency of electricity as a lighting agent that leads so many people to expect that sooner or later there will be a corresponding advance in its efficiency as a fuel. It is on this unfounded belief that so many hopes are based which are doomed to disappointment.

To show the wastefulness of the conversion of the potential heat energy of coal into electrical energy, the author proceeded to quote some of the main conclusions in the report issued as the result of the investigation by Sir Dugald Clerk, Prof. Cobb, and Prof. Smithells of the question of the relative efficiencies of coal gas manufacture and electrical generation, from the point of view of coal conservation. There has, he proceeded, been a great deal of talk about the possibility of first carbonizing the coal and recovering the bye-products, and then utilizing the gaseous energy to generate electric energy for distribution; but this has never been carried out on any large working scale, and the weight of authority so far is against the probability of it proving the most commercially economical method of producing electric energy. The alternatives, therefore, are carbonization at the gas-works, and combustion with loss of bye-products.

The case for gas fuel economy is up to this point absolutely conclusive; but there remains to be considered fuel efficiency from the point of view of cost to the individual user, because if it is more costly for him to use gaseous fuel than crude coal, he will, if he be a business man, feel compelled, and if he be a private householder, be strongly inclined, to continue to use crude coal, in spite of the arguments in favour of gaseous fuel from the public point of view. This is human nature; and we cannot make it the subject of complaint—we have to deal with it as practical people. To furnish an idea of how the cases stand for the use respectively of gaseous fuel, crude coal, and electricity, from the individual consumer's point of view, Mr. Goodenough said he had worked out the following figures, which he believed to be reliable comparisons of the cost—the fuel cost only—of useful heat to the consumer obtained by the employment respectively of coal, coke, gas, and electricity. These were based on coal and coke at 50s. per ton, gas at 1s. per therm (the quantity of heat contained approximately in 200 c.ft. of gas), and electricity at 3d. per Board of Trade unit.

Coal (50s. per ton) costs from 9d. to 2s. 3d. per therm of useful heating (*a*).
Coke (50s. per ton) costs from 8d. to 1s. per therm of useful heating (*b*)
Gas (1s. per therm) costs from 1s. 3d. to 2s. 3d. per therm of useful heating (*c*).
Electricity (3d. per unit) costs from 7s. 6d. to 10s. per therm of useful heating (*c*).

(*a*) According to whether required for regular or intermittent heating.
(*b*) Only comparable in cases where fairly constant heating is required.
(*c*) According to efficiency of utilization, varying in different processes.

For constant use, coke is the cheapest fuel if the cost of fuel alone is considered. This is particularly so in regard to steam raising. It will be seen (and the figures are supported by experience) that gas used in the most favourable circumstances is actually cheaper in direct fuel cost than coal used in the most unfavourable circumstances—and *vice versa*. Comparisons between the two depend entirely upon the circumstances in which fuel is required and used. It is in the case of intermittent use that gas easily beats all comers. But when we consider comparative costs when heat is required for considerable periods, there are a number of important considerations other than actual fuel costs to be taken into account. We have to draw-up a balance-sheet. What is true in the factory and workshop, is also true in the home. The budget must be taken as a whole.

In conclusion, he asserted with confidence that experience has fully proved that the use of gaseous fuel is, in the majority of instances, as advantageous to the consumer as it is desirable from the point of view of the community as a whole—and that it is in the carbonization, instead of the combustion, of coal that we can get nearest to the ideal of 100 p.ct. in fuel efficiency.

Still Further Efficiency Likely.

Sir DUGALD CLERK remarked that there was little to say in the way of criticism of the paper. He did not think they need necessarily assume that when our coal was finished the British Empire would be done; but there was no doubt that the fuel resources of the world were rapidly shrinking. Of course, there was an enormous field for electricity and for expansion and increase in thermal efficiencies of gas. It was quite possible that in a few years' time they might run up with the internal combustion engine to something between 40 and 45 p.ct. This would make a lot of difference. But the possibilities of improvement in gas making efficiency were still very great. He thought the next step would be an alteration in the laws with regard to the different methods imposed upon gas undertakings for producing gas. There were methods of producing gas other than those employed; and these ways might lead to a gas-making efficiency of not far short of double the present efficiency. It was now about 45 p.ct., and in some places 50 p.ct.; and it might get up to 75 or 80 p.ct. ultimately. If they wished greatly to extend the use of gas for power purposes, the price per therm must bear a certain ratio to the price per therm of coal. It was very largely used for engines at present; but it could be very much more largely used, if this higher efficiency became a general practice. There would then be an enormous increase in the use of gas for heating and power—and also for lighting, because one did not know where the efficiency value of incandescent gas-lighting was going to stop. There was a good deal of scope for increasing the efficiency in use of gas-consuming appliances, as well as for increasing efficiency in production. There could be no doubt that there was a tremendous expansion pending in the use of gas for all industrial and commercial purposes.

Mr. CHARLES CLARE said no one had done more than Mr. Goodenough to popularize gas. There was, however, still much to be done; and wide publication of the paper just read would prove very valuable. Too much publicity could not be given to questions of this kind.

Mr. W. H. PATCHELL, who briefly put forward the case for electricity, declared that if it had not been for those who made the dynamo and motor and big electrical stations the great commercial proposition they were to-day, Mr. Goodenough and his associates would still be "grovelling in the tarry wickedness of years ago." The high efficiency of gas-works to-day was due to electricity. Enough credit had not been given to the saving of domestic energy by the use of electric light as compared with gas lighting.

Mr. E. J. SADGROVE, speaking as an architect, referred to the damage done to historical buildings by the burning of crude coal, and stated that, in a fine building he was now engaged on in the West End, he was not installing one coal-fireplace. What heating there was to be done would be by gas and by a central system—none of the coal-fires which emitted into the atmosphere gases and smoke that were destructive, not only to public buildings, but also to life.

After a brief reply by the author, he was accorded a hearty vote of thanks for his paper, as was also the Chairman for presiding.

COAL GAS—ITS APPLICATION TO INDUSTRY.

By H. M. THORNTON, J.P., Assoc.Inst.C.E., M.I.Mech.E.

A very interesting lecture under the above title was given on Wednesday last by Mr. H. M. THORNTON, of London (Vice-Chairman and Managing Director of the Richmond Gas Stove and Meter Company, Ltd.), at the gas exhibition organized by the Leeds Gas Department, and now being held in the Artillery Drill Hall, Fenton Street, Leeds. Mr. C. S. Shapley (Engineer and Manager of the Leeds Gas Department) took the chair, and in his remarks referred to the many important installations of gas appliances in operation in Leeds. He invited the manufacturers present to avail themselves not only of the "Radiation" industrial apparatus stand at the exhibition, but also of the Gas Department's demonstration room, where information could always be obtained and many types of furnaces, &c., seen in operation.

Mr. THORNTON commenced by showing that the application of heat was a universal necessity of industry, and that every manufactured article, in some stage of its production, owed something to the use of heat. The problem confronting the manufacturer was how to apply the heat most economically and effectively. He then gave many substantial reasons for advocating the use of gas for industrial purposes, laying particular emphasis on the following points:

Economy in the space occupied—giving as an illustration a case, typical of many others, where industrial gas appliances only occupy the same space as one coal-fired appliance, which meant three times the output for the same factory area.

Reduction in capital outlay, in that no smoke-stack, no structural alterations to factory, nor special foundations are needed.

Labour is saved by no stoking, no clinkering or removal of ashes, nor transport of fuel being required. Owing to the self-contained character of the gas appliance, its cleanliness, and the absence of soot, smoke, and grit in the workshop, the choice for its position is practically unlimited, and it can be brought into proximity with the machine worker, and thus saves intermediate handling.

The cost of fuel is reduced. No storage accommodation is required, and no stock of coal or coke involving rent and interest on capital outlay. Mr. Thornton gave various illustrations showing how the cost of gas consumption for different classes of work was less than the cost with other fuels.

Gas eliminates waste, giving easy and complete control and avoiding the spoiling of materials by incorrect temperatures, for which reason many works use gas largely. This claim was amplified by references to important industries requiring temperatures within the narrow limits of a very few degrees; and it is by the constancy of the gas-furnace that these stringent requirements are being met.

Gas speeds-up output. The lecturer gave very many interesting examples showing how that, owing to the uniformity of temperature and the time saved, the output was in some cases doubled and in others nearly trebled.

The remainder of the lecture was devoted to showing the wide extent to which gas has entered into the services of industry and become the universal servant of the manufacturer. The B.C.G.A. have compiled particulars showing that no fewer than 3000 trades now use

gas in the manufacture of their various products, and that there are 350 different gas appliances in use in industry.

Then followed over fifty slides showing different processes for which gas is used—annealing, hardening, and tempering of steel, forging, metal-melting, brazing, assaying, enamelling, and japanning. Also the raising of steam, the melting and annealing of glass, the melting of sugar, the baking of bread and biscuits. Particularly interesting slides illustrated the uses of gas in the shipbuilding industry, and in the great Lancashire and Yorkshire cotton and cloth industries. The hat trade, the boot trade, and numerous others were also shown to be utilizing gas on a very extensive scale. The lecture fully substantiated Mr. Thornton's claim that gas was the universal servant of industry, and that there is hardly a commodity into which gas does not enter in its production.

The lecturer concluded with a strong plea for the further substitution of gas for raw fuel, on the grounds of the national advantages to be gained by the abatement of smoke. The slides he showed of the emission of smoke from factory and domestic chimneys in some of our important towns must have convinced the audience of the drastic necessity for taking steps to ameliorate this evil. "Every smoking chimney," said Mr. Thornton, "pouring forth its wasted energy, pollutes the atmosphere, obstructs the sunshine, poisons our lungs, and lowers our physical fitness. Our large cities pay a heavy tribute year by year through the continuance of this evil. The national case for the extended use of gas is overwhelming. The commodity we are considering has played a great part in the life of this country, and is destined to take a still more prominent place in the future."

GAS AS AN ECONOMIC AID TO BUILDING CONSTRUCTION.

By Major F. C. WHEELER.

[A Paper read at the Leeds Gas Exhibition, Feb. 18.]

I have been asked by Mr. Shapley, the Engineer and Manager of the Gas Department of this city, to read a short paper on the subject of gas as an economic factor in modern building construction. I propose to subdivide the subject into four headings—the advantages of gas from the national point of view, the economic point of view, the labour saving point of view, and lastly, as an aid to economic construction.

A few years ago anyone who publicly advocated the use of gas as the primary means of heating our houses and producing hot water for all domestic uses, would have been considered somewhat revolutionary; but the enormous improvements that have been effected by the leading makers of modern gas apparatus, from the point of view of economy and efficiency, places gas in the forefront of all other methods.

THE NATIONAL POINT OF VIEW.

One of the greatest national evils to which we are subjected is smoke. Fog is, of course, incidental to a sea-girt island; but the soot and dirt, and consequent discomfort, are not incidental and are solely due to our wasteful and conservative habits of burning raw coal.

No doubt many of you have read the interim report of the Committee on "Smoke and Noxious Vapour Abatement." The introductory paragraph in the report of the Committee reads as follows:—"We are satisfied that domestic smoke, which is produced by burning raw coal, causes serious danger to health and damage to property. The urgent need for open-air sanatoria in this country is abundant proof from a health point of view, and the world-wide appeal to save Westminster Abbey is a glaring example of the damage sustained to our historic buildings by reason of our smoke-laden atmosphere." The Committee proceed further to say: "It has been established that methods are available for warming our rooms, cooking, and the provision of hot water, which produce little or no smoke, and are hygienic, economical and save labour."

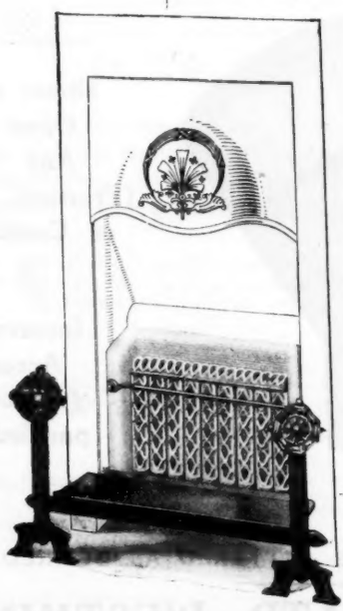
It appears to me that the great housing schemes which are now being undertaken with the aid of the Government subsidy afford a unique opportunity of securing the adoption of these methods in the new houses. It is interesting to note in this respect that the Ministry of Health are now advocating gas as a means to this very desirable end; and I invite your attention to a small booklet issued by the Ministry, entitled, "How to Obtain a House of Your Own," price 2d. The price quoted I need hardly say refers to the publication and not to the house.

In this pamphlet you will see illustrated plans and elevations of an extremely well-designed bungalow, in which gas-fires are provided everywhere, with the exception of the living room, which has a coal grate. In this case I have calculated that at least £50 has been saved by the elimination of the coal chimney breasts, the brickwork in the stacks, and other costs that are incidental to the old method of flue construction.

THE ECONOMIC POINT OF VIEW.

It has been estimated that even in industrial areas domestic chimneys contribute at least 50 p.ct. of the total smoke nuisance, and that no less than 60 p.ct. of the bituminous coal ordinarily burnt in domestic fireplaces escapes unconsumed into the atmosphere as soot. The Coal Mines Department give a figure of 40,500,000 tons as the amount of coal burnt annually in the United Kingdom—in its natural condition for domestic purposes. The loss in the form of soot amounts to no less than 2,430,000 tons, or more than half the total amount of fuel required to heat the metropolitan area for a whole year. That is to say nearly 2,500,000 tons of soot escape every year from domestic fireplaces alone and polute the atmosphere. Therefore, the burning of raw coal from an economic point of view is an extremely wasteful proceeding, as not only are the valuable products of tar, oils, ammonia, sulphur, and cyanogen compounds lost, but in addition thousands of feet of coal gas and a large proportion of unconsumed fuel escape in

Neat and Distinctive.



THE "Entente" Fire is neat, distinctive, and handy. All unnecessary iron framework is eliminated, ensuring brick to brick contact between the coal grate and the gas fire. The "Entente" blends with its surround. It is not a dull iron excrescence. It appeals to the public and sells well.

R. & A. MAIN, LTD.

the form of soot, owing to inefficient apparatus. Further, domestic soot contains a considerably higher percentage of carbon and tar than factory soot; and by reason of its large percentage of tar it adheres to everything upon which it falls, and is therefore more obnoxious and destructive than soot emitted from factories.

Statistical evidence shows a close relation between the death rate and the atmospheric conditions. The number of deaths from pulmonary and cardiac diseases is shown to increase in direct proportion to an increase in the intensity and duration of smoke fogs. The importance of sunlight is too obvious to need any argument, for it has been estimated that 20 p.ct. more sunlight is experienced in the country than in a smoky town.

Buildings and Decorations.

Extremely valuable and striking evidence was given before the Commission by Sir Frank Baines, the Director of Works of His Majesty's Office of Works, in which he drew attention to the very serious damage occasioned to our public and other buildings by smoke and other impurities in the atmosphere. For instance, £250,000 is required to save the Abbey Church of Westminster—a magnificent structure built largely from a soft sandstone quarried in the Reigate district; and more than 300 years ago there were bitter complaints in regard to the terrible destruction from which it was suffering owing to the depredation of coal smoke. The thousands of pounds now required to repair this ancient fabric is solely caused by the wasteful use of coal. Millions of money are sent up our chimneys, but more millions are required to make good the damage caused. The damage done to softer and more delicate materials—such as curtains, draperies, coverings, and carpets—is too well appreciated by all of us to need enlarging on.

I shall now deal with a few of the possible methods which might be employed to minimize the production of smoke. Raw coal burnt in open grates is admittedly the prime cause of the smoke trouble and gives the lowest efficiency. Dr. Margaret Fishenden, on behalf of the Fuel Research Board, recently carried out exhaustive tests with an ordinary coal burning grate, and her investigations established *inter alia* the following results:

Coal fire	20 to 24 p.ct. efficiency
Coke fire	30 to 33 p.ct. ,,
Gas fire	60 p.ct. ,,
Electric fire	100 p.ct. ,,

Let us now consider the two latter methods of heating our homes. I will take electrical heating first. Electric heating, from a point of view of simplicity and cleanliness, is undoubtedly the most attractive alternative to the open coal grate. From a labour-saving point of view electric cooking and heating has many advocates; but the high price at present charged in most localities renders its adoption prohibitive for general purposes. Possibly the advent of the much vaunted super-stations will bring about this very desirable end.

In the case of gas, the principal advantages are its efficiency which from a heating point of view is about double that of solid fuel; its cleanliness; and, with all modern gas apparatus, the complete absence of noise and smell, and the easy way the temperature can be regulated. Even in cases where continuous heating is required, these advantages often more than compensate for the higher cost of gas when measured by thermal units. For rooms requiring intermittent heating, the cost is less than solid fuel.

The quantity of sulphurous acid and sulphuric acid fumes from a gas-fire is very much less than from a coal-fire, while there is an entire absence of soot and smoke which have been shown to be so deleterious to the community in general. The witnesses who appeared before the Smoke Abatement Committee almost without exception condemned the old-fashioned kitchen range and back-boiler, which in a brave endeavour attempts to warm the room, supply hot water, and heat the oven and hot plate. But at what cost of fuel, labour, and creation of dirt, dust, and soot! A large majority of people have almost abandoned the use of their kitchener in favour of the gas cooker; and I venture to predict in the near future all coal-burning grates (with possibly the exception of one in the living room) will also be discarded. In America to-day the coal cooker is unknown—the gas cooker being an integral part of the house. Economy is the political shibboleth of the moment; anti-waste campaigns are the order of the day—at any rate on paper; and yet without the creation of any grandiose Ministry millions of pounds could be saved annually in this country by a simple Act of Parliament restricting the use of coal to (say) one room per house.

The Labour Saving Point of View.

The ladies present will appreciate best the saving of labour effected by gas for heating our rooms and for the provision of hot water. Incidentally, in my own house we have been able to dispense with one maid, which I estimate, at the present price of living, is a clear saving of £100 per annum, or rather more than double my gas bill. Again, we are asked by the Government to find £97,000,000 for education. Can we reasonably expect any modern expensively educated maid to soil her manicured fingers in a dirty coal grate? The absence of dirt in a room warmed by a gas-fire is a very noticeable feature; and the enormous amount of brushing and dusting of our rooms is reduced to a minimum. The necessity for carting heavy coal scuttles, laying fires, and the subsequent removal of ashes and cleaning of grates, disappears at once with a gas-fire; and it has been proved conclusively that for intermittent heating our bedrooms, dining rooms, &c., the gas-fire is cheaper than coal.

Gas as an Aid to Economic Construction.

For many years past a gas-fire has been regarded rather in the nature of an auxiliary than as a permanent means of warming our rooms But I firmly believe, that as the advantages of gas heating become more generally appreciated, the labour-making coal fire will gradually disappear from the majority of our rooms, and will be replaced by a modern built-in gas-fire.

The London County Council, the Office of Works, and many of the housing authorities throughout the kingdom are now installing built-in

USE Simmance's

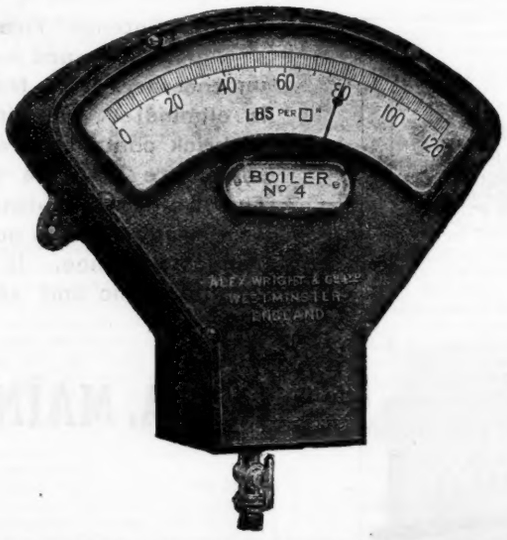
DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.



Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

gas-fires for bedrooms and parlours, with one coal fire for the living room. The progress made in gas-flue construction has been largely brought about by the excellent propaganda work of the British Commercial Gas Association. The introduction of the narrow gas-flue built in the thickness of the partition or external wall has rendered obsolete the old-fashioned brick-built flue, into which it has been customary in the past to take the products of combustion.

Before proceeding further with details of the new flue construction I should like to draw your attention to some comparative plans of the parlour-type house designed originally for coal-fires and subsequently redesigned for the adoption of small concrete flues and gas-fires. The most striking feature is the elimination of the two flank chimney breasts and stacks, the reduction in size of the central stack, and the consequent gain in floor space and cubic contents of the parlour and bedrooms. The saving effected by the use of gas has been carefully worked out by one of our leading quantity surveyors, and the results I venture to say are an eloquent testimony to the economies I am advocating. Reduced to figures the savings are as follows:

SUMMARY.

Trade.	Additions. £ s. d.	Omissions. £ s. d.
Excavator and concreter . .	0 6 0	3 4 3
Bricklayer and mason . . .	41 6 2	104 2 3
Carpenter	4 17 0	2 3 11
Smith, plasterer, plumber, and painter	63 16 3	63 6 10
	£110 5 5	£172 17 3
Less amount of additions.		110 5 5
		£62 11 10

With the ordinary coal-flue construction, the convenience and comfort of a room are frequently to be sacrificed to the arbitrary position of the fire-place—due to the fact that coal flues must be grouped together for economic reasons and to gather the flues into one or more stacks. With the concrete gas-flues, the most suitable of the four walls can be selected for the position of the fire, due regard being given to the presence of windows, doors, and furniture. How often one finds in otherwise well-planned houses that one or two rooms are spoilt by the door opening on to the fireplace, or the accommodation round the fire is made uncomfortable and draughty, being placed midway between the windows and the doors.

I invite your attention to the plans of some offices recently erected in the City of London.* In the first plan you will see the usual stereotyped form of coal flue construction, and I would ask you particularly to notice the large amount of floor space taken up by the chimney breasts in these small rooms. The architect originally planned the offices for coal-fires; but when his attention was drawn to the great advantages of gas-fires and narrow concrete flues, fresh plans were prepared and approved immediately by the owners.

The results obtained were as follows: (1) An increased floor space equal in area to a room 10 ft. by 10 ft., which at a conservative rental of £80 a year equals a gain of £1600 on the capital value of the premises. (2) The building cost was reduced by a sum amounting to nearly £200. (3) The economy obtained from a labour-saving point of view is apparent. The labour and dirt involved in maintaining eleven coal fires, not to mention the cartage of some 20 tons of coal up several flights of stairs, amply repay the slight extra cost of gas.

*These were reproduced in the "JOURNAL," Vol. CXLVII., p. 241.

METER TESTING IN MANCHESTER.

Visit to the London Road Station.

In accordance with a resolution unanimously come to at a meeting of the Manchester City Justices Gas-Meter Testing Committee last December, "that the Chairman be empowered to invite the gas-meter manufacturers of the district to visit the station," Mr. H. N. Barrow, J.P, (the Chairman of the Justices' Committee) welcomed last Thursday week a party of gentlemen interested in the industry, who were subsequently conducted by the Chairman, the Chief Inspector (Mr. S. Dyson), and Mr. Gollins (the Assistant Inspector), through the building—a thorough examination being made of the working of the Department, a description of which appeared in the "JOURNAL" for Dec. 8 last [p. 574].

The party afterwards repaired to the Grand Hotel for luncheon. It had been hoped that the Lord Mayor (Alderman Kay), who is Chairman of the Gas Department, would have received the visitors; but important business having called him away, the Deputy-Chairman of the Gas Committee (Councillor Cundiff) officiated in his absence.

After the Loyal Toast and the health of the Lord Mayor had been drunk, Mr. George Braddock submitted "The Chairman of the Manchester City Justices' Gas-Meter Testing Committee." He referred in eulogistic terms to the work which Mr. Barrow had accomplished as the controlling head of the department, and said the value of this work was well known in the gas-meter trade. It reflected the greatest possible credit upon Mr. Barrow that he should have so ungrudgingly placed his ability in this respect at the call of the City of Manchester. From what he had seen that day, he felt convinced they were working on the right lines in Manchester.

Supporting the toast, Mr. Cockey alluded to the work which Mr. Barrow had done, not only in Manchester, but along with himself and Mr. Ollis (of the London County Council), in connection with the deputation that waited upon the Board of Trade.

Replying, Mr. Barrow said it would have been impossible for him to have carried out the duties if it had not been for the splendid support that his Committee had accorded him. Throughout the last twelve

By Appointment
CARRON

Carron Gas Cooking Apparatus

recognised by the Catering world as the standard in Culinary Appliances—embrace all requirements for Home, Hotel, or Institution.

The selection includes Cookers, Grillers, Toasters, Ranges, Carving and Boiling Tables, Hot Closets, Roasting, Baking, and Pastry Ovens, Water Boilers, Tea Infusers, Steaming Ovens, Fish Frying Suites, &c.

¶ *Drawings and Estimates Gratis. Write for No. 6B Gas Cooking Apparatus Catalogue—post free on application.*

CARRON COMPANY

— Works —
CARRON, STIRLINGSHIRE.
— Branch Works —
Phœnix Foundry, SHEFFIELD.

Showrooms:—LONDON—(City) 15, Upper Thames Street, E.C.4; (West End) 50, Berners St., W.1. LIVERPOOL—Redcross St., GLASGOW—Buchanan Street, EDINBURGH—George Street, BRISTOL—Victoria Street. BIRMINGHAM—Corporation St.
Offices: MANCHESTER—14, Ridgefield, and NEWCASTLE-ON-TYNE—15, Prudhoe Street.

No. 2115 Gas Griller and Toaster.

Strongly constructed of Cast-iron and suitable for hard continuous use. Griller has two compartments 18 ins. deep, each heated by independently controlled bunsen burners and complete with grill tin and tinned grid, brander and brick deflectors. Fitted with white porcelain enamelled sole plate and mounted on cast-iron stand with grid shelf between legs.

months, they had taken a most active part in the affairs of the department, and were now only anxious to see maintained the reputation of the station, which he was glad to say was a very high one in the country. While the Committee were well aware that they were an administrative body, and called upon to see that the Sale of Gas Act was duly carried out, they were also mindful that their visitors were a most important class of manufacturers. He could assure them that any meters coming to the London Road testing-station at Manchester would receive fair treatment. They were in a position to cope with more meters than the number they were receiving yearly; and he trusted that, after what the manufacturers had seen, they would give the Committee the best support they could in the future. The Committee thought very highly of their Chief Inspector, Mr. Dyson; and the station itself spoke of the efficient work he had done.

The toast of "Our Guests" was proposed by Mr. W. H. Hesketh (an old member of the Justices' Committee); and Colonel Glover, in acknowledging the good wishes, said the visit had been a most interesting one. Those present would take away with them the opinion that Manchester had a testing-station second to none in the country. Mr. Helps also responded.

CONDITION OF THE RHYL GAS-WORKS.

At a Meeting of the Rhyl Urban Council, held last week, the question of the gas undertaking was discussed. The present position of affairs was specially reported upon by the Gas Engineer (Mr. L. G. Hall). He stated that last season the works were supplying the largest quantity of gas it was possible to produce. The present plant was insufficient and defective in various aspects; and owing to the fact that all coal tar and liquor had to be carried so far to and from the works, the working cost of manufacture was appreciably increased. The problem before the Council now (the Engineer said) was the provision of new plant sufficient to meet future demands for gas—the alternatives being: (1) The erection of new works, or (2) additions to the existing works. He had gone fully into the question of building a works on a new site, in such a position that a railway siding could be run into it, the same to be provided with the most up-to-date plant. The cost of these works would be £60,000, making use of those portions of the existing plant and buildings which can be moved to the new site. The present was an excedingly bad time to erect new works. In these circumstances, the best course was to put down such plant as would enable the Council to carry on for a few years. He, therefore, strongly recommended them to erect the following: (1) Carburetted hydrogen plant; (2) an additional boiler; and (3) sulphate plant. The total estimated cost would be £10,500.

The Gas Committee recommended that the portion of the report relating to the "erection of new works" be deferred, as suggested by the Engineer, but that the part relating to "additions to existing works" be adopted. It was recommended that application be made to the Ministry of Health for sanction to borrow the sum of £10,500 for the purpose of carrying out the additions.

The CHAIRMAN said the Engineer's report asked for more careful consideration. For years there had been some agitation for the removal of the works to another site; but there were strong reasons against the proposal just now. The most practical course for the present appeared to be what the Committee recommended.

The ENGINEER, in the course of further observations, said he had no hesitation in saying that the town's gas supply could not be maintained unless the works recommended were carried out.

Mr. T. D. JONES remarked that it should be kept in mind that gas was not going to be the illuminant of the future. Electricity was coming into its own more, and big electricity schemes were being promoted all over the country, some of them closely affecting the parts round Rhyl.

The CHAIRMAN (Councillor J. R. Jones) said, despite Mr. T. D. Jones's assertion, more gas was being consumed to-day than ever before.

The recommendations of the Committee were agreed to.

TRADE NOTES.

[For "Journal" Advertisers.]

Woodall-Duckham Verticals at Sheffield.

The Sheffield Gas Company have accepted the tender of the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for the erection at their Neepsend works of two benches of 7-ton vertical retorts, with a total carbonizing capacity of 336 tons per 24 hours.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 21.

The London market for tar products continues in a very depressed condition, and little business is reported. Prices are purely nominal.

Sulphate of ammonia continues in fair demand for the home market at schedule prices.

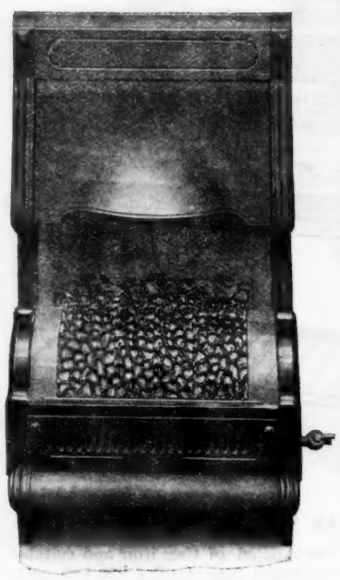
Tar Products in the Provinces.

Feb. 21.

There is practically nothing to report. All tar products are exceedingly dull. There does not seem to be any prospect of an improvement until trade generally improves. Pitch is still in a position which makes it almost impossible to name a figure which may be taken as the market value. There does not appear to be any business doing,

WILSONS' "PERIAL SUNBEAM"

GAS FIRE.



The "PERIAL SUNBEAM" Gas-Fire has been specially designed to fit the coal grates where the extension at the bottom is not removable, and therefore it is not possible to fit an ordinary "SUNBEAM." The "PERIAL" is made in two sizes only.

No. of Stove.	No. of Flames.	Width Within Brick-Sides of Coal Grate.
9	9	For 13 inches opening
10	10	For 15 inches opening

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and great difficulty is being experienced in getting buyers to take delivery on contracts already made. Creosote is very quiet, and few orders are obtainable. Naphthalene is dull, and consumers are trying to resell on contracts already made. All white products are dull, and business difficult. Tar acids are almost unsaleable.

The average values for gas-works' products during the week were: Benzole 90 p.ct. North, 2s. 11d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 1s. 1½d. to 1s. 3d. Solvent naphtha, naked, North, 2s. 10d. to 3s. Heavy naphtha, North, 3s. to 3s. 2d. Creosote, in bulk, North, liquid, 1s. to 1s. 0½d.; salty, 11½d. to 1s. Heavy oils, in bulk, North, 1s. to 1s. 1d. Carbolic acid, 60 p.ct., 1s. 10d. to 2s. Naphthalene, £25 to £30; salts, £8 10s. to £10, bags included. Anthracene, "A" quality, 1s. per minimum 40p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little business moving in tar products at the moment—practically only sufficient to keep the market from being absolutely depressed. The withdrawal of the restrictions on export has come too late to have any effect upon demand, as this class of business is entirely dead for the moment. Signs point to a serious fall in all classes of fuel; and it is difficult to say how pitch is going to be exempt from sharing in the downward movement. In some quarters the outlook is considered bad, and a fall to £5 per ton is looked for. This may be an extreme view; but during the last few days transactions have taken place as low as £7 per ton for small quantities only. Creosote is an easy market; but there does not appear to have been any definite change in quotations. Manufacturers have ceased extracting carbolic acid wherever that is possible; but at the moment in some cases there is a quantity produced which comes on the market. Present prices are still well above pre-war figures; but they are not high enough to counteract the general increase in the cost of production. Benzole prices are not changed, but there has been a slackening of demand; the idea being that both benzole and petrol prices will have to come lower. For solvent naphtha there is very little demand. Intermediate products remain on the slow side, although there are signs of revival in one or two lines.

The range of quotations is as follows:

Benzole: 90% London 3s. 10d., North 3s. 7d. to 3s. 9d.; 50-90% 3s. 3d. London, 3s. to 3s. 1d. North; crude 60-65%, 2s. 3d. to 2s. 5d.; pure, 3s. 3d. per gallon naked.

Crude Tar: London, 105s. to 115s.; Midlands, 107s. 6d. to 112s. 6d.; North, 105s. to 107s. 6d. per ton *ex* works. Refined tar, 85s. per barrel (free) on rail.

Pitch: London, 155s. to 170s. per ton f.o.b.; East Coast, 155s. to 170s. per ton f.o.b.; West Coast, 152s. 6d. to 160s. f.a.s., with Manchester 160s. per ton, and Glasgow 155s. per ton; South Wales, 160s. per ton.

Solvent Naphtha: 90-160, 2s. 3d. per gallon.

Crude Naphtha: Naked, 11d. to 1s. 1d.; North, 1s. per gallon.

Heavy Naphtha: 2s. 8d. per gallon.

Naphthalene: Refined flake, £22 to £26 per ton nominal; inferior, £20; crude, £7 10s. to £14 per ton, according to quality.

Toluol: Naked, 3s. 4d. per gallon nominal; North, 3s. 2d.; pure, 4s.

Creosote: 1s. to 1s. 1d. per gallon; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 1s. 2d. to 1s. 4d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 5s. per ton f.o.r. makers' works.

Pyridine: 18s. per gallon.

Aniline Oil: 1s. 7d. per lb., drums extra.

Aniline Salts: 1s. 9d. per lb.

Cresylic Acid: Crude, 2s. 6d.; dark 95-97%, 2s. 9d. to 3s.; pale 97-99%, 3s. 3d. to 3s. 6d., per gallon, drums free.

Carbolic Acid: Crude 60%, 1s. 10d. per gallon; crystals 40%, 8d. per lb. nominal.

Salicylic Acid: Technical, 1s. 4d.; B.P., 2s. per lb.

Xylol: Pure, 3s. 9d. to 4s. 3d.; commercial, 3s. 3d. to 3s. 9d. per gallon.

Resorcin: 7s. 6d. to 8s. 6d. per lb.; pure, 21s. per lb.

Alizarine 20%: 2s. per lb.

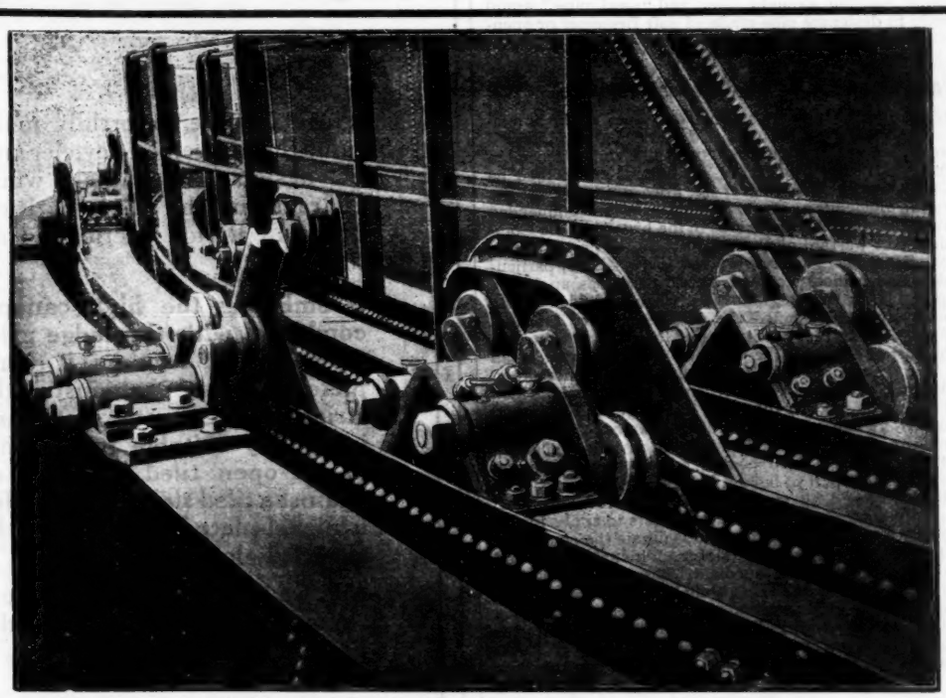
B. Naphthol: 3s. per lb.

Sulphate of Ammonia.

The demand for sulphate of ammonia is very poor at the moment; many consumers holding off the market in anticipation of further decline in values. This, however, is hardly likely to come about, since the costs of production are not falling. On the other hand, makers are showing a very firm front, which indicates that they anticipate a revival in demand very shortly. There is a slight improvement in the export movement to be noted in the last few days.

On instructions of the Directors, Messrs. A. & W. Richards are offering an issue of £42,000 of 7½ p.ct. redeemable debenture stock for the Ilford Gas Company. The issue price is par; and it is to be redeemed at par on Jan. 1, 1931. Offers should be sent in not later than next Monday morning. The money is required to enable the Company to meet expenditure on extensions of works and mains rendered necessary by the constantly growing demand for gas.

The Bradford Property Owners' Association have requested the Bradford Corporation Gas Committee to take over all the gas-meters from the landlords of the city. The present owners are prepared to give their meters to the Corporation free if the Corporation will undertake to maintain and keep them in repair. A Sub-Committee of the Corporation was appointed last Friday to consider the matter, after which a report will be presented to the full Committee.



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MANCHESTER.

Board of Trade and Regulation Act Applications.

The Clerk to the Heston and Isleworth Urban District Council reports that, in accordance with an invitation from the Director of Gas Administration, representatives of the various authorities who have lodged objections to the application of the Brentford Gas Company, attended at the offices of the Board of Trade, and an inquiry into the application was held by Mr. H. C. Honey. A suggestion that the inquiry should be adjourned, in order that the Company might produce their books for inspection, was not adopted; and Mr. Honey intimated that it must proceed on the basis of the cost of production appertaining at the date when the Company prepared their application—namely, in October last. It was also intimated that the Board had received 200 applications under the Act; and that, for the purposes of the calculation of the present standard price, they would be bound by the precedent adopted in the case of the Gas Light and Coke Company, and would allow from the 540 standard calorific power, prescribed by section 66 of the Brentford Gas Act, 1914, a deduction of 7½ p.ct.—this being the percentage which, under section 67 of the Act, is allowed before the Company are rendered liable for forfeiture for deficient calorific power.

Pipe Nomenclature in the United States.

Some discussion is taking place in America with regard to the ambiguity of certain terms made use of in the designation of piping. The "Plumbers' Trade Journal" over there, referring to the matter, says that, when the pipe-maker takes a length of steel and a length of wrought-iron, and forms them into pipe, he performs exactly the same operation on both materials—he bends them into tubular shape and welds the edges. Quite correctly, therefore, the American Society for Testing Materials, in their specifications, use the word "welded" in conjunction with both wrought-iron and steel pipe made by the processes of welding, as distinguished from pipe made by other processes. Probably some thirty years after the introduction of welded steel pipe the term "wrought pipe" or "wrought steel pipe" was coined by steel-pipe manufacturers; and this term gradually came into use, so that steel pipe would be listed as "wrought pipe." The average buyer, not acquainted with this trade name, frequently labours under the impression that it means "wrought-iron pipe." In fact, the names being so much alike has led to the term "wrought-iron pipe" being interpreted as meaning steel pipe. Some contractors, indeed, who, where wrought-iron pipe was specified, installed steel pipe, have been able to escape responsibility in lawsuits, on the plea that "wrought-iron pipe" is a trade term meaning either wrought-iron or steel pipe, as distinguished from cast-iron pipe. Suggestions have since been made which it is thought would ultimately result in eliminating confusion of puddled wrought iron with pipe made from soft steel. The proposal is to apply the term "welded pipe" when both wrought-iron and steel pipe are referred to; and that the terms "wrought-iron pipe" and "steel pipe" be used and interpreted respectively to mean exactly what they imply. Thus "wrought-iron pipe" would mean only pipe which is made from genuine puddled wrought iron; and "steel pipe" would be used exclusively to designate pipe made of soft Bessemer or open-hearth steel.

Walker and Wallsend Gas Company.

Moving the adoption of the report and balance-sheet at the annual meeting, Mr. C. J. Potter (the Chairman) said that, when he addressed the shareholders a year ago, he indicated that dividends were more likely to rise than fall. The favourable position, as could then be seen, appeared to justify the lowering of the price of gas to 2s. per 1000 c.ft., raising the dividends under the sliding-scale as recommended to be declared that day, both being records in the history of the Company. The main factor warranting the reduction in the price of gas a year ago was the extraordinary values received for residuals, particularly coke for shipment, which provided increasing values up to the time of the deplorable coal strike, following which a sudden slump occurred that had adversely affected the year's estimated revenue, and encroached upon the surplus profits carried forward from the previous year. The cost of coal over the previous year was equal to an increase of 9d. per 1000 c.ft. of gas sold; but this was more than counterbalanced by the additional values received for residuals, which were equivalent to over 1s. 3d. per 1000 c.ft. The wages bill advanced about 5d. per 1000 c.ft.; while materials and other charges cost considerably more. Since 1914 the consumers had had the advantage of cheap gas, at an average cost of 2s. 6d. per 1000 c.ft., or only 1d. over the pre-war price. It was most difficult to budget for the present year. The output of gas had increased by 11·72 p.ct. over the previous year. The directors asked the approval of the shareholders to apply for an Order under the Gas Regulation Act, 1920, to facilitate the conditions for the raising of already authorized capital, for additional capital, and for other general provisions thought expedient. They were also applying for power to charge for gas on the heat-unit basis. The report and balance-sheet were adopted, and approval given for the Board of Trade applications. Half-yearly dividends, less income-tax, were declared as follows: Preference stock, 5 p.ct. per annum; ordinary 3½ p.ct. stock, £5 5s. p.ct. per annum; and ordinary 5 p.ct. stock, £6 15s. p.ct. per annum.

Gas Light Company's Price and Slide per Therm.—At a meeting last Thursday of the Court of Common Council of the Corporation of the City of London, a communication was read from Mr. H. C. Honey, Director of Gas Administration of the Board of Trade, relative to the application of the Gas Light and Coke Company for an Order under section 1 of the Gas Regulation Act, 1920. He stated that the standard price of gas to be fixed by the Order is to be 15·2d. per therm, and that the terms of the sliding-scale under which the dividend payable by the Company is to depend upon the price of gas is to be modified by substituting one-fifth of a penny per therm for one penny per 1000 c.ft. The communication was referred to the Streets Committee.

RICHMOND'S

"Empire"

Gasfire.

A new "Period" design for 1921.

The "Empire" worthily maintains the high efficiency, elegance of design and finish which characterise the whole of Richmond's "Period" series of Gasfires.

It embodies the high canopy, combined with the ledge principle which renders it completely proof against the stringent "Lancet" tests, and is equally suitable for placing in an open tiled fireplace or against a tiled slab. The fender is nickel-plated and reflects the cheerful glow of the fire.

All wearing parts are interchangeable with any "Period" Fire of a similar size.

Ready for Immediate delivery.

THE RICHMOND

GAS STOVE & METER CO., Ltd.

WARRINGTON —— and —— LONDON

Success of Tully Plant at Porthcawl.—It was reported at a recent meeting of the Porthcawl Urban District Council that excellent results have been obtained from the working of the new Tully plant. There has been a saving in one week of 15 tons of coal, and an increase of 35,800 c.ft. in the quantity of gas made.

Fatality at the Coventry Gas-Works.—A fatal accident at the Coventry Corporation Gas-Works to a labourer named Walter Ford was the subject of an inquest before Dr. C. W. Iliffe. The case was notable as being the first fatality at these works during the thirty years of their existence. Deceased had been engaged in assisting to load a girder on to a bogie. After the bogie had started, he followed alongside, and when it had gone a little way, his body was seen under the bogie, and he was picked up badly mutilated. Hugh Singleton, who was in charge of the work, stated that he saw all clear before giving the signal to the man in charge of the capstan to start the bogie. Deceased had said it was a pure accident, and he had slipped. The verdict was "Accidental death," with no one to blame.

Pontypridd and Coke-Oven Gas.—The coke-oven gas supply for which they have been hoping is still held-up for want of materials at the ovens; and the Pontypridd Gas Company are communicating with the Great Western Colliery Company, to see if the work cannot be expedited. The Gas Manager (Mr. David Muir) declared that, if the supply is not forthcoming by the end of this month, it will be necessary to increase the price of gas, owing to the cost of manufacture at the works.

Aberystwyth Gas Company.—The Directors report a very satisfactory condition of the Company's finances. The balance of profit (£1422) for the past half year exceeds the amount required for dividends and interest by £603, which sum goes to reserve. Under present statutory conditions, shareholders are precluded from appropriating any portion of this balance; but it is hoped that in the near future these conditions may be altered to their advantage. The Directors recommend the payment of dividends at the rate of 5 p.c. per annum on the several classes of shares. They record with sincere regret the death of Mr. Hugh Hughes, for many years Chairman.

STOCK MARKET REPORT.

AGAIN it must be reported that no sign of improvement in the condition of things on the Stock Exchange was perceptible last week as in its predecessor. All the old sinister factors were in operation: Dear money, bad trade, pressure to realize, and general apprehension as to crucial questions of State policy.

The gilt-edged Market was distinctly dull. Home Government issues were irregular, with more losers than gainers. In the big four, only Victory contrived to make a fractional advance, Friday's figures being: Consols 46⅛ 46¾, War Loan 85-85 5/16, Funding 70-70⅜, Victory 76⅝-77⅜. Bonds showed weakness with the rest. Home Rails shrank day by day; but just before the close there was a slight reaction.

The Foreign Market did pretty well. French, Brazilian, Chinese, and Japanese were firm. Russians were almost nominal.

The Miscellaneous Market had many weak spots. Rubber was dull, and Oils irregular, though with a slight rally here and there. Industrials were not strong, Textiles and Iron and Steel giving way. Shipping was dull.

Business in the Gas Market started with all the animation and activity of the previous week; but this only lasted a couple of days, when it suddenly dried-up and remained very quiet until the close. There was very little change in values. Of the London Companies, Gas Light and Coke alone was affected—the ordinary dropping a point. South Metropolitan and Commercial did not move. In Provincials, Newcastle was quoted ¾ higher. Imperial Continental was quieter, and the quotation was lowered 2. Primitiva changed hands at rather lower figures.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 40½, Brentford "B" 49½, 50½, Cape Town preference 5 1/16, 5½, European 5⅜, Gas Light ordinary 54⅛, 54¼, 54½, 54⅝, 55, 55¼, ditto maximum 38½, 39¼, 40, ditto preference 57, Imperial Continental 123⅛, 124¼, 124½, 125, 126, 126½, Primitiva 9s., 10s, ditto preference 26s., 26s. 6d., 26s. 10½d., 27s., South Metropolitan 62, 62¼, 62½, 63, South Suburban 57½, Tottenham "A" 59, Harrow and Stanmore 5 p.ct. 55. On Tuesday, Bournemouth "B" 8⅜, 9, Commercial 4 p.ct. 53, ditto 3½ p.ct. 48, 49, ditto debenture 43¼, Gas Light ordinary 53½, 54, 54¼, 54½, 54⅝, 55, ditto maximum 39, 39½, ditto preference 56⅜, Imperial Continental 124¼, 125, Primitiva preference 27s. 6d., South Metropolitan 62¾, 63, ditto debenture 46½. On Wednesday, Gas Light ordinary 54½, 54¼, ditto maximum 39½, Imperial Continental 124, 124½, 124¾, Primitiva preference 26s. 3d., 27s., South Suburban 58. On Thursday, Gas Light ordinary 54, 54¼, ditto maximum 38½, ditto preference 56½, 57½, ditto debenture 47¼, Imperial Continental 123½, 124¼, 125¼, Primitiva 10s., ditto preference 26s. 6d., South Metropolitan 61¾, 62½, 62¾, 63. On Friday, European 5⅛, Gas Light ordinary 54, 55, ditto maximum 39⅝, Imperial Continental 123½, 124⅜; 125, South Metropolitan 62½, 62¾, Tottenham "B" 51¼, 51⅜.

In the Money Market, there was a strong demand, increasing to a point of real tightness in mid-week, but easing to a slight extent before the close of the week. Discount followed suit. Silver had a considerable fall in the absence of buyers. The Bank rate is 7 p.ct., as fixed on April 17 last.

Messrs. James Milne and Son, Ltd., call attention to the fact that, in the course of the notice in last week's "JOURNAL" of the goods shown by them at the Leeds Exhibition their lamps were referred to as "Lumex" lamps, instead of "Lumax."

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 27	4	4%	Aldershot 4 p.c. Pref.	...	53—58	..
1,551,868	,,	Oct. 14	2½	3 1/16%	Alliance & Dublin Ord.	59—64	38—43	40½
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	5½—6½	4—4½	...
100,000	5	Aug. 12	16	5%		..	8—9	..
383,110	10	,,	7	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	8¼—9½	8½—9
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	7¼—8½	...
162,065	—	Dec. 30	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	...	55—60	...
992,045	Stk.	July 14	14	30/-	Brentford A Consolid.	261—266	50—55	...
734,920	,,	,,	11	26/3	Do. B New	204—209	47—52	49½—50½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	...
214,775	,,	Aug. 27	11	7½%	Brighton & Hove Orig.	208—213	100—110	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	75—85	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 15	12½	10%	British	44—45	21—23	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	50—55	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	37—40	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	..
100,000	10	Dec. 10	—	4½%	Do. 4½ p.c. Pref.	4—6	5—6	5⅛—5½
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	55—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Aug. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	53—56	53
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	48—49
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45	43½
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	25—30	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—40	..
51,600	,,	Aug. 27	14½	10%†	Croydon A 10 p.c.	...	125—135	...
278,400	—	,,	11½	7%†	Croydon B and C 7 p.c.	..	90—100	..
492,270	Stk.	—	6	4 1/2%†	Derby Con. Stk.	123—125	...	.
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5%	European, Ltd.	17½—18	5½—6½	5½—5¾
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas 4 p.c. Ord.	98—102	53—56*	53¾—55½
2,600,000	,,	,,	3½	26/3	Light 3½ p.c. max.	76—79	38—41*	38¾—40
4,062,235	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	55—58*	56½—57½
4,674,850	,,	Dec. 15	3	3%	Coke 3 p.c. Con. Deb.	72½—74½	45—48	47½
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 15	5	3½%	Hastings & St. L. 5 p.c.	...	53—58	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	37—39	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8¼—9¼	...
86,600	Stk.	Sept. 15	9	5½%	Hornsey 7 p.c.	...	87—89	...
131,000	,,	Aug. 12	7½	4½%	Ilford A and C	151—154	77—81	...
65,780	,,	,,	6½	3½%	Do. B	115—118	57—62	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	54—56	...
4,940,000	,,	,,	9	4½%	Imperial Continental	150—160	122—127	123¾—126¼
1,235,000	,,	Feb. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	90—95*	...
235,242	,,	Sept. 15	6½	5%	Lea Bridge Ord. 5 p.c.	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. A.	211—213	...	...
					Liverpool 5 p.c. Ord. B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 12	7/5/6	3½%	Maidstone 5 p.c.	..	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4¾	1¾—2¼	...
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	86—93	...
541,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd.	11½—12	68—73	...
1,875,892	,,	July 29	4½	3½%†	Newcastle & Gatsh'dCon.	98½—99½	56½—57	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Sept. 15	—	8%	North Middlesex 10 p.c.	...	12¾—13¾	..
55,940	10	,,	7/14/0	5½%	,, ,, 7 p.c.	14—15	7—7½	...
300,000	Stk.	Nov. 26	8	8%	Oriental, Ltd.	117—122	93—98	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
60,000	50	Aug. 27	13	7½%	Portsea Island, B	128—131	65—70	...
100,000	50	,,	12	6¼%	Do. C	118—121	50—55	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1—1⅛	9/—10/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4¾—5	1¼—1½	26/—27/6
321,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	67—69	...
600,000	Stk.	Jan. 27	4	4%	Do. ,, ,, 1911	...	39—41	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	37—40	...
150,000	10	Sept. 30	6	6/-	San Paulo 6 p.c. Pref.	10½—11	6½—7½	...
125,000	50	Jan. 3	5	5%	San Paulo 5 p.c. Deb.	47—49	37—39	...
135,000	Stk.	Aug. 27	10	5%	Sheffield A	223—224	63—66	...
209,984	,,	,,	10	4%	Do. B	222—224	63—66	...
523,500	,,	,,	10	3½%	Do. C	220—222	60—62	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Sept. 30	9	9%	South African	10½—11½	10½—11½	...
6,609,895	Stk.	Feb. 10	5/4/0	5%†	South Met. Ord.	111—113	61—64*	61½—63
250,000	,,	Jan. 13	—	5%	Do. Red. Pref.	...	90—92	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	45—48	46½
224,820	,,	Aug. 27	8½	7½%†	South Shields Con. Stk.	157—159	89—91	...
1,087,795	,,	July 29	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	56—61	57½—58
247,558	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	65—70	...
647,740	,,	Nov. 12	7½	3½%	Southampton Ord.	99—102	55—58	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	57—59	...
120,000	,,	Aug. 12	—	3½%	Tottenham A 5 p.c.	135—138	57—62	59
782,275	,,	,,	6	2½%	Tottenham and District B 3½ p.c.	115—117	50—55	51½—51¾
181,255	,,	Dec. 15	4	4%	Tottenham and District 4 p.c. Deb.	87—89	55—58	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Sept. 15	5	3½%	Tynemouth 5 p.c. max.	108½—109	69—71	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 27	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80	...
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55	...
352,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	43—48	...
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	,,	Dec. 30	3	3%	3 p.c. Deb. Stk.	66—69	43—45	...

* Ex Div. † Next dividend will be at this rate.

Progress at Weston-super-Mare.—That the business continues to show splendid progress and expansion, is the report of the Directors of the Weston super-Mare Gas Company for the past year; the sales of gas having again increased, compared with 1919, by 37,964,400 c.ft., or 13·35 p.ct., which they consider to be extremely satisfactory. Under the Weston-super-Mare Gas (Temporary Increase of Charges) Order, 1920, the amount of dividend is, by order of the Board of Trade, reduced during the continuance of the Order to 3¾ p.ct. per annum; and at the meeting on Monday, the Directors recommended the payment of this amount of dividend on the ordinary stock for the half year ended Dec. 31.

British Industries Fair at Birmingham.—The Birmingham Section of the British Industries Fair was opened on Monday, at Castle Bromwich Aerodrome; and it will continue until March 4. There are over 600 exhibits, which is about the same number as last year, though a number of firms have enlarged their stand space. A huge gangway, providing accommodation for stands, connects two buildings. The fair completely fills three spacious buildings; and the display of manufactured goods is remarkably diversified. But it is no exaggeration to say that gas heating and lighting apparatus, and fittings, constitute one of the largest and most interesting features. To these detailed reference will be made next week.

Pudsey Gas Company.—Deep regret is expressed by the Directors at the loss the Company have sustained by the death of the late Chairman, Mr. Squire Spencer, who had rendered good service on the Board for the past nineteen years. As compared with the preceding twelve months, sales of gas showed an increase of 7·34 p.ct. The increased cost of coal, material, and labour necessitated a further application to the Board of Trade under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, for powers to increase the price of gas; and an Order was made increasing the price from 4s. 2d. to 5s. per 1000 c.ft. An interim dividend was paid at the rate of 5¼ p.ct. on the new consolidated 7 p.ct. stock; and the dividend for the past half year is at the same rate (subject to approval by the Board of Trade).

Stockton Gas Supply.—To a special meeting of the Stockton-on-Tees Corporation on the 15th inst., it was reported that the Gas Committee had considered tenders for new purifying plant. Of seven submitted, the lowest was that of Messrs. Ashmore, Benson, Pease, & Co., Ltd, of Stockton, at £15,907. This it was decided to accept. Other work necessary in connection with the full completion of the purifiers, it was estimated, will cost £24,277; and the Town Clerk was instructed to apply to the Ministry of Health for sanction to a loan of this amount. Mr. M'Naughton, the Acting Chairman of the Gas Committee, said it had been thought advisable to bring the matter forward at the earliest possible moment, because it would develop into one of extreme urgency. The vital point was that they required £24,000 for the plant. This was imperatively required at the works to meet next winter's demand. The present purifying capacity at the works was 2 million c.ft. per day; and during the last few months, this capacity had several times been overtaxed to the tune of at least another 500,000 c.ft. per day. The natural consequence was that the quality of the gas had suffered. In addition to this the Committee were going to spend £50,000 to extend their present carbonizing plant, and next winter would increase the make of gas by between 20 and 25 p.ct. The tender accepted was that of a local firm with a world-wide reputation; and one pleasing feature was that a large amount of the expenditure would come back to the town in the way of wages. Alderman Nattrass believed that this was the first admission of a candid nature that the Gas Committee had recognized that the gas supplied was at times wretchedly bad. If the purifying plant, however, had been so greatly overtaxed, it was a reasonable explanation of the position. Of late he supply had distinctly improved.

Larger Sales at Dorchester.—Submitting the accounts for the past year, the Directors of the Dorchester Gas and Coke Company reported a further increase in the sale of gas of 3,034,800 c.ft., and also that the returns for coke and other residuals were very satisfactory. The cost of coal and other materials, and wages and rates, had again advanced, which had necessitated another increase in the price of gas during the period under review. The price now charged is 5s. 6d. per 1000 c.ft., which, under the Company's sliding-scale, allows the payment of a dividend amounting to 7 p.ct., of which an interim dividend of 4 p.ct. was paid. The Directors, therefore, recommended, at the recent meeting, a dividend at this rate on the ordinary capital, and 6 p.ct. on the preference capital, both less income-tax.

Library Lighting in Camberwell.—At the meeting of the Camberwell Borough Council last Wednesday, the matter of the lighting of the central library was referred to. The open-access system has been agreed to; and the question was as to the lighting to suit the altered conditions. The Public Libraries Committee reported: "In the first place, we directed our attention to the question as to whether the library should be continued to be illuminated by gas, or whether it would be advisable to substitute electricity; and, in connection with this matter, we had before us a report made by Dr. Samuel Rideal with regard to ventilation and the action of the acids in the gas and air upon the books in the institution. There can be no doubt that these acids have a prejudicial effect on the leather binding of the books; and this has resulted in additional expenditure being necessary for re-instatement, and has materially affected the life of the books throughout the borough. The question of the renovation of the buildings was also considered; and we are satisfied that the cost of any works to the institution in this direction will be considerably reduced in the event of our recommendation in favour of the installation of electric light being adopted. In addition, the cost for maintenance of electric fittings, lamps, &c., will, we estimate, be less than the present outlay for maintenance of mantles, glasses, &c.; and we recommend that gas be abolished, and the entire building be illuminated by electricity." The recommendation was agreed to.

An inquest was held at Blackburn regarding the death of Robert Hamriding, an employee at the Great Harwood Gas-Works, who, working near the retorts, was trapped between the electric retort-charging machine and a pillar, sustaining injuries which resulted in his death. "Accidental death" was the verdict.

The Dunfermline Gas Committee have decided that tenders shall be procured for a gas-exhauster of 100,000 c.ft. per hour capacity, compressor of 50,000 c.ft. capacity, and governors. An improvement is to be made in the method of storing coke.

The fusing of an electric wire in a department of the Hebden Bridge Co-Operative Society's Bridge Gate branch, caused an outbreak of fire last Sunday week. The vigilance of the police in detecting the outbreak happily saved a great amount of damage being done.

At Huddersfield, a coke hawker named Charles Cruikshank was fined £7 10s. on each of three charges of obtaining sums by false pretences, and ordered to refund £3. It was stated that he obtained coke from the Corporation gas-works for retail sale and had tampered with the weigh notes; the result being that the weight of coke and the charge appeared larger than they should have done.

The Rhyl Urban Council some time ago engaged Mr. L. E. Thomas, F.C.S., to carry out laboratory tests at the gas-works. From a report which has been presented to the Gas Committee, the work has proved very satisfactory; and the appointment has been more than justified. It is proposed to continue Mr. Thomas's services until the end of the financial year, and then to reconsider the position.

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